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American Veterinary Medical Association

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(Original Official Organ U. S. Vet. Med. Ass'n.)
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POULTRY DISEASE NUMBER

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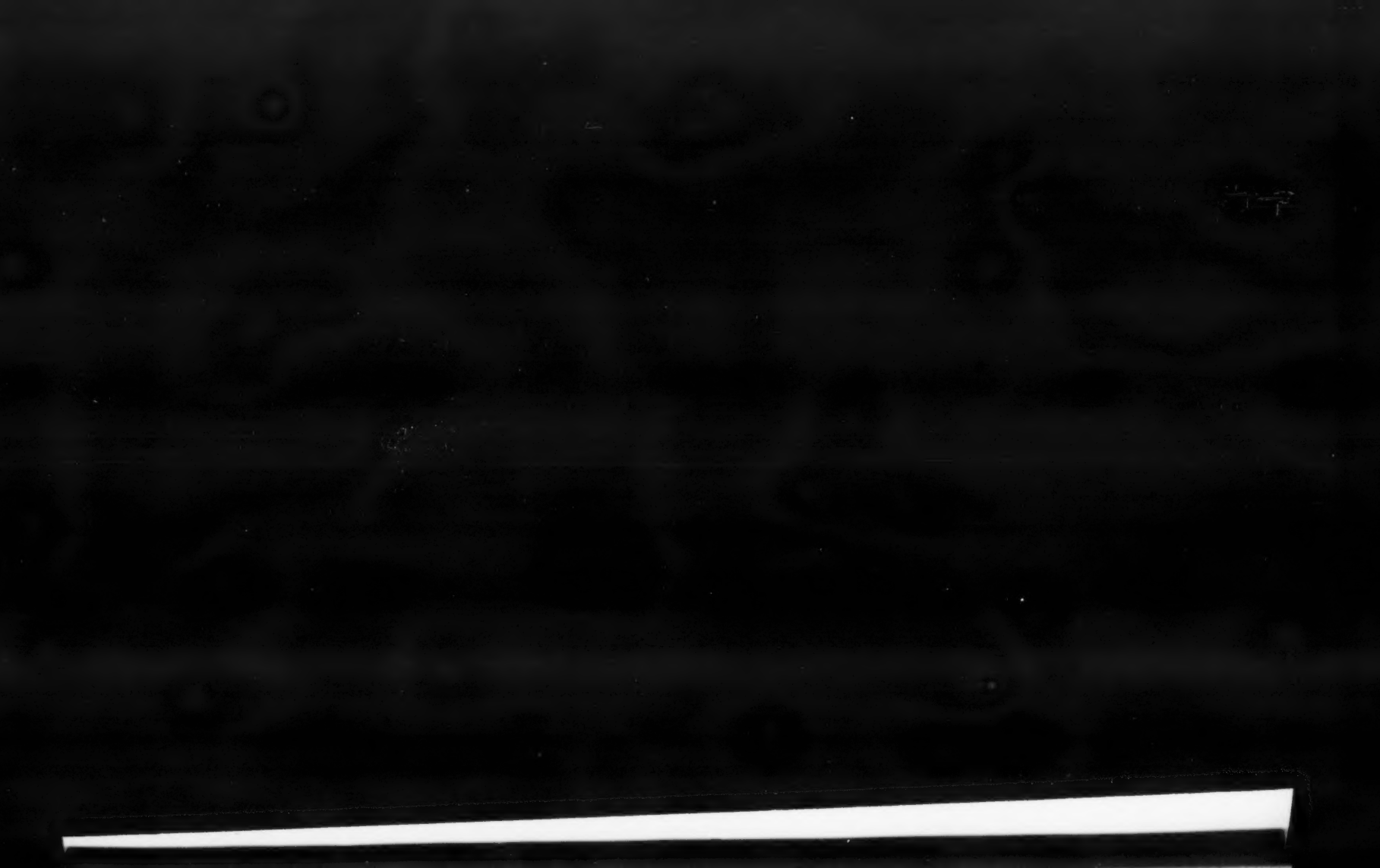

JOURNAL

OF THE

American Veterinary Medical Association

FORMERLY AMERICAN VETERINARY REVIEW

(Original Official Organ U. S. Vet. Med. Ass'n.)

H. Preston Hoskins, Secretary-Editor, 716 Book Building, Detroit, Mich.

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A BUSY MONTH

The month of January, just drawing to a close, will be remembered as one of the busiest months we have ever put in. One of the direct results of this extraordinarily busy month is the late appearance of this issue of the JOURNAL, now about four days behind schedule. The fact that we were "on the road" about ten days during January, attending meetings in Madison, Wis., Ithaca, N. Y., Des Moines, Iowa, and East Lansing, Mich., is only one reason why the month has been such a busy one. The incoming mail has been very heavy and we have been able to take care of only the very pressing letters with any degree of promptness. We ask our members to bear with us in this connection.

This is the month when many members pay their annual dues. On an average, about one member in five takes advantage of the opportunity to enclose a letter, asking for this, that or the other information. It frequently happens that the information asked for has to be assembled and this process may take an hour. The actual dictation of the reply may be a matter of only five minutes. We like to hear from our members, but if you do not get a reply by return mail, please do not be impatient, especially during the "rush" season.

To give a better idea of how heavy our correspondence is at times, we will say that one mail, about the middle of January,

brought fifty-two letters that required replies and over forty of these were of such a character that our own personal attention was necessary in taking care of them. There were letters inquiring about membership and reinstatement, liability insurance, positions and locations, articles for publication, advertising and publicity, invitations to attend meetings, requests for information on certain diseases, suggestions for the program of the Minneapolis meeting, requests for back numbers of the JOURNAL, references to articles published in the JOURNAL, reprints, membership lists, addresses of veterinarians, and other things too numerous to mention.

President Hilty has been equally busy. He has attended meetings in Columbus, Ohio, Indianapolis, Ind., Columbia, Mo., and East Lansing, Mich. Judging from the reports thus far received, he has "made a hit" every time he has been "at bat." This is undoubtedly reflected in the way requests for application blanks have been coming in lately. This month we are listing thirty-six applications for membership, the largest number listed in any February since the present system has been in operation. A recent examination of our books showed almost 500 more members with their current dues paid than on the corresponding day one year ago. On February 15 we will send Treasurer Jacob one of the largest checks ever sent him, representing receipts for January. Things are looking up and we are glad to be able to say so.

DEATH LOVES A SHINING MARK

Just six weeks following the death of Dr. J. A. Kiernan, another brilliant career in the veterinary profession came to an end with the passing of Dr. E. C. Schroeder, superintendent of the Bureau of Animal Industry Experiment Station, at Bethesda, Maryland. Both men were experts of the highest order. Both knew bovine tuberculosis as few others did, although the work of one was sharply defined from the other. Dr. Kiernan was an outstanding authority on the control and eradication of tuberculosis, from the standpoint of a live stock sanitary official. Dr. Schroeder was laboratory-trained and his contributions to our knowledge of tuberculosis were the results of his labors with the test-tube and microscope. It is true that Dr. Schroeder made fruitful researches in other fields, but his death, so soon after that of Dr. Kiernan, causes his investigations of and published papers on tuberculosis to loom large in our mind's eye.

Dr. Schroeder's conspicuous ability as both writer and speaker made him an attraction on any scientific program. His papers were marked by a diction such as is possessed by very few investigators. In his discussions his logical deductions were the mark of a man who knew his subject thoroughly. Those whose privilege it was to attend the 1923 meeting of the United States Live Stock Sanitary Association will recall the discussion which followed the presentation of the papers on tuberculosis. Although lost through the death of the reporter before his notes were transcribed, Dr. Schroeder's remarks will go down as a classic, in the memories of those present. He was the master of his subject.

Life's race well run,
Life's work well done,
Life's victory won,
Now cometh rest.

A REMINDER

To those who show a marked desire to become rather free and careless with the word "accredited," as it pertains to animal disease control, we might suggest that they read the foreword of the report of the Committee on Tuberculosis of the United States Live Stock Sanitary Association, made at the 25th annual meeting, November 29, 1921. The report recommended, among other things: "The word 'accredited' must be kept inviolate, for it means only one thing."

OUTLINE OF PROGRAM FOR MINNEAPOLIS

	Monday Aug. 6	Tuesday Aug. 7	Wednesday Aug. 8	Thursday Aug. 9	Friday Aug. 10
Morning	Meetings of Committees	Opening Session	Sectional Meetings	Sectional Meetings	Clinic
Afternoon	Meeting of Executive Board	General Session	General Session	General Session	Clinic
Evening	State Association Conference	Alumni Meetings. President's Reception	Banquet	General Session —— Papers	

APPLICATIONS FOR MEMBERSHIP

See October, 1927, JOURNAL

FIRST LISTING

ACAVEDO, RAMON A. Div. of Vet. Med., University Farm, St. Paul, Minn.
D. V. M., Kansas State Agricultural College, 1927
Vouchers: W. L. Boyd and R. Fenstermacher.

AIKEN, YOUNG J. Lubbock, Texas
D. V. M., Kansas City Veterinary College, 1916
Vouchers: Leon G. Cloud and Frank D. Porter.

BERTHELSON, J. G. Alamosa, Colo.
D. V. M., Kansas State Agricultural College, 1926
Vouchers: Geo. H. Glover and H. L. Morency.

BLANCHE, GEORGE W. 831 Milford, Glendale, Calif.
D. V. M., Iowa State College, 1902
Vouchers: W. L. Curtis and John L. Tyler.

BOLSTAD, BERNARD M. Appleton, Minn.
D. V. M., Kansas City Veterinary College, 1912
Vouchers: C. O. Eliason and A. J. Thompson.

BURDICK, E. E. Huron, S. Dak.
V. S., Ontario Veterinary College, 1896
Vouchers: G. P. McCue and C. C. Lipp.

COFFEY, RUSSELL F. Eskridge, Kans.
D. V. M., Kansas State Agricultural College, 1920
Vouchers: Chas. W. Bower and R. R. Dykstra.

COOK, ROBERT A. 924 Del Paso Blvd., Sacramento, Calif.
D. V. M., San Francisco Veterinary College, 1916
Vouchers: W. L. Curtis and David F. Fox.

COWAN, HAROLD WALES 11053 83rd Ave., Edmonton, Alta.
V. S., B. V. Sc., Ontario Veterinary College, 1912
Vouchers: J. C. Hargrave and J. Buie.

DICKE, WILLIAM MARION Paola, Kans.
D. V. M., Chicago Veterinary College, 1920
Vouchers: E. L. Dicke and Chas. W. Bower.

GIVEN, JOSIAH A. Marcus, Iowa
D. V. M., McKillip Veterinary College, 1919
Vouchers: C. C. Donelson, A. J. Miller and John B. Bryant.

HAAG, WALTER M. Box 11, Arabi, La.
M. D. V., McKillip Veterinary College, 1903
Vouchers: W. G. Ross and S. C. Cook.

HAIMBAUGH, GEORGE DOW Rochester, Ind.
D. V. M., Chicago Veterinary College, 1914
Vouchers: T. A. Sigler, Reuben Hilty and F. J. Muecke.

HAMILTON, CHESTER M. Western Washington Exp. Sta., Puyallup, Wash.
D. V. M., Colorado Agricultural College, 1927
Vouchers: J. W. Kalkus and C. E. Sawyer.

HAMNER, ROBERT H. 44 Post Office, Birmingham, Ala.
D. V. M., Alabama Polytechnic Institute, 1919
Vouchers: C. C. Middleton and R. E. Jackson.

HAWKINS, I. L. Cascade, Iowa.
D. V. M., Iowa State College, 1918
Vouchers: C. H. Stange and John B. Bryant.

KILE, J. C. West Jefferson, Ohio.
D. V. M., Ohio State University, 1920
Vouchers: Walter R. Hobbs and D. M. Swinehart.

LE FEVRE, DANIEL D. 125 W. Miller St., Newark, N. Y.
D. V. M., Cornell University, 1903
Vouchers: F. E. McClelland and C. A. Roig.

MCCLURE, WILL E. Hutchinson, Kans.
D. V. M., Kansas City Veterinary College, 1905
Vouchers: A. H. Gish and S. L. Stewart.

MCCOSH, NEWTON A. Box 23, Randolph, Kans.
D. V. S., Kansas State Agricultural College, 1917
Vouchers: Joseph P. Scott and J. H. Burt.

MIDDLEHOFF, GERRET EARLE Oroville, Calif.
D. V. M., San Francisco Veterinary College, 1911
Vouchers: W. L. Curtis and John L. Tyler.

MYLAN, FLOYD A. Remsen, Iowa.
D. V. M., Chicago Veterinary College, 1919
Vouchers: W. F. Hodam and W. F. Guard.

PIERSON, IRA J. Box 64, Lawrence, Kans.
D. V. M., Kansas City Veterinary College, 1918
Vouchers: Chas. W. Bower and P. B. Darlington.

RITTER, W. J. Creston, Nebr.
D. V. M., Kansas State Agricultural College, 1920
Vouchers: Frank Breed and Floyd Perrin.

SCHALK, KARL W. Iowa Falls, Iowa
D. V. M., Iowa State College, 1914
Vouchers: H. D. Bergman, C. H. Stange and John B. Bryant.

SCHLAEGEL, MERRILL PHILIP Burr Oak, Kans.
D. V. M., Kansas State Agricultural College, 1920
Vouchers: Joseph P. Scott and J. H. Burt.

SCHRAG, OTTO J. Box 236, Freeman, S. Dak.
D. V. M., Iowa State College, 1926
Vouchers: Fred Evans and G. G. Faber.

SHERRILL, BERT O. 929 Park Ave., Indianapolis, Ind.
D. V. M., Indiana Veterinary College, 1908
Vouchers: Reuben Hilty, T. A. Sigler and F. J. Muecke.

SMITH, H. G. Exira, Iowa.
D. V. M., Kansas City Veterinary College, 1917
Vouchers: R. C. Byrnes, A. C. Drach and John B. Bryant.

STEARNS, TROY JOSEPH Box 161, Russellville, Ky.
D. V. M., Chicago Veterinary College, 1916
Vouchers: N. D. Hedges and E. Calldemeier.

STUART, JAMES E. State Dept. of Agr., Capitol Bldg., Sacramento, Calif.
D. V. M., Colorado Agricultural College, 1922
Vouchers: F. M. Hayes and W. L. Curtis.

TARBILL, LESLIE M. Mt. Sterling, Ohio.
D. V. M., Ohio State University, 1926
Vouchers: Reuben Hilty and D. M. Swinehart.

WEIMER, FRANK D. Cumberland, Iowa.
D. V. M., Kansas City Veterinary College, 1916
Vouchers: A. C. Drach, C. H. Stange and John B. Bryant.

WHITAKER, ROSS LANDESS Fayetteville, Tenn.
D. V. M., McKillip Veterinary College, 1917
Vouchers: M. Jacob and G. A. Metcalf.

WOLF, OTTO ERNEST Big Spring, Texas.
D. V. M., Colorado Agricultural College, 1921
Vouchers: Leon G. Cloud and Frank D. Porter.

YOUNGBLOOD, ROBERT WALKER Henderson, Ky.
M. D. V., McKillip Veterinary College, 1909
Vouchers: E. Calldemeier and F. M. Kearns.

Applications Pending

SECOND LISTING

Bogan, James Joseph, 110 W. Bridge St., Catskill, N. Y.
Caslick, William, 504 N. Aurora St., Ithaca, N. Y.
Church, Harold L., Battle Creek, Nebr.
Cleland, Lauren Wilson, 429 N. Bluff St., Janesville, Wis.
Coon, Charles J., Wamego, Kans.
Day, William Edward, General Delivery, South St. Paul, Minn.
Hunt, M. P., 207 Leslie St., Lansing, Mich.
Loudon, Roy V., 511 W. 4th St., McCook, Nebr.
Madson, Archie R., Mishicot, Wis.
Rogers, Festus Loren, Cadiz, Ohio.
Simon, Henry Albert, Coleridge, Nebr.
Van Ness, Walter R., Lebanon, Ohio
Vara, Joseph J., Bonifay, Fla.
von Rosenberg, Hilton O., Hallettsville, Texas.
Wenborne, Harry Geoage, Allenton, Wis.

The amount that shall accompany an application filed this month is $9.58, which covers membership fee and dues to January 1, 1929, including subscription to the JOURNAL.

COMING VETERINARY MEETINGS

Connecticut Veterinary Medical Association. Hotel Garde, Hartford, Conn. Feb. 1, 1928. Dr. Geo. E. Corwin, Secretary, 11 Warrenton Ave., Hartford, Conn.

New York City, Veterinary Medical Association of. Academy of Medicine, 5th Ave. & 103rd St., New York, N. Y. Feb. 1, 1928. Dr. C. P. Zepp, Secretary, 128 W. 53rd St., New York, N. Y.

San Diego-Imperial Veterinary Medical Association. San Diego, Calif. Feb. 1, 1928. Dr. W. G. Oliver, Secretary, 3821 Arizona St., San Diego, Calif.

Oklahoma State Veterinary Medical Association. Huckins Hotel, Oklahoma City. Feb. 6-7-8, 1928. Dr. Frank R. Knotts, Secretary, Stillwater, Okla.

Southwestern Tuberculosis Conference. Oklahoma City, Okla. Feb. 7-8, 1928. Dr. C. H. Fauks, Secretary, 1919 W. Ash St., Oklahoma City, Okla.

Alabama Veterinary Medical Association and Short Course for Practitioners. Auburn, Ala. Feb. 7-8-9-10-11-12, 1928. Dr. C. A. Cary, Secretary, Auburn, Ala.

Hudson Valley Veterinary Medical Society. Albany, N. Y. Feb. 8, 1928. Dr. J. G. Wills, Secretary, 122 State St., Albany, N. Y.

Southeastern Michigan Veterinary Medical Association. Detroit, Mich. Feb. 8, 1928. Dr. H. Perston Hoskins, Secretary, 716 Book Bldg., Detroit, Mich.

Kansas State Agricultural College Conference for Veterinarians. Manhattan, Kans. Feb. 8-9, 1928. Dr. R. R. Dykstra, Dean, K. S. A. C., Manhattan, Kans.

Arkansas Veterinary Association. Little Rock, Ark. Feb. 9, 1928. Dr. T. M. Dick, Secretary, Little Rock, Ark.

Ontario Veterinary Association. Prince George Hotel, Toronto, Ont. Feb. 9, 1928. Dr. H. M. LeGard, Secretary, 223 Main St. N., Weston, Ont.

Illinois Veterinary Conference, University of. Urbana, Ill. Feb. 13-14, 1928. Dr. Robt. Graham, University of Illinois, Urbana, Ill.

Chicago Veterinary Society. Great Northern Hotel, Chicago, Ill. Feb. 14, 1928. Dr. J. B. Jaffray, Secretary, 2956 Washington Blvd., Chicago, Ill.

Southeastern States Veterinary Medical Association. Jacksonville, Fla. Feb. 14-15, 1928. Dr. J. I. Handley, Secretary, Box 1533, Atlanta, Ga.

Southern California Veterinary Medical Association. Chamber of Commerce Bldg., Los Angeles, Calif. Feb. 15, 1928. Dr. W. L. Curtis, Secretary, 1264 W. 2nd St., Los Angeles, Calif.

Louisiana State Veterinary Association. Baton Rouge, La. Feb. 15-16, 1928. Dr. H. A. Burton, Secretary, Alexandria, La.

Kansas City Association of Veterinarians. New Baltimore Hotel, Kansas City, Mo. Feb. 21, 1928. Dr. J. D. Ray, Secretary, 400 New Centre Bldg., Kansas City, Mo.

Northwestern Ohio Veterinary Medical Association. Toledo, Ohio. Feb. 29, 1928. Dr. F. A. Lambert, Secretary, Columbus Serum Co., Sta. C., Box 53, Columbus, Ohio.

CENTRAL PENNSYLVANIA VETERINARY CLUB

At the annual meeting of the Central Pennsylvania Veterinary Club, Dr. F. Romig, Beaver Springs, was elected president; Dr. F. Kocher, Espy, vice-president; and Dr. G. M. Leighow, Danville, secretary.

True to Form

Doctor: "Did you tell that young man of yours what I thought of him?"

Daughter: "Yes, Papa; and he said that you were wrong in your diagnosis, as usual."

THE CONTROL OF POULTRY DISEASES IN THE UNITED STATES*

By J. R. MOHLER,

Chief, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

The subject of my remarks this evening was inspired by the Third World's Poultry Congress, held last month in Ottawa, Canada. This Congress was attended by over 4000 members from forty-two nations, including a number of veterinarians from the United States, Canada, and other countries as far away as Egypt. Twenty-four of these veterinarians presented papers before the Congress and three of them were selected as presiding officers at different sessions. The well-balanced distribution of time devoted to the five main topics—breeding, marketing, nutrition, extension, and last, but not least, diseases—showed an evident desire to deal with poultry problems in a broad and proper way, rather than to permit any subject of unusual or especially timely interest to dominate the discussions. There were 170 papers delivered in five simultaneous meetings, in different halls of the great auditorium, during the nine days of the Congress, which gave one a field of poultry information to draw from that covered every phase of the poultry industry. Acres of commercial exhibits at Landsowne Park, showing every known kind of feed, fence and fixture, made one realize forcibly to what extent the industry has grown. The immense live-bird exhibit, containing stately monarchs and their consorts of prize-winning pens from every corner of the earth, showed the wide-spread interest of breeders throughout the world. The federal Department of Agriculture demonstrated by detailed models the story of this country's mammoth poultry business, from the nest to world-wide markets; specialists told how our breeders sold 800,000,000 baby chicks last year, and the statisticians showed that our egg-production reached 2,000,000,000 dozen, or 760 eggs each second in 1926.

Everyone concurred that the Congress was an outstanding success in beauty, utility, hospitality, and achievement and would exercise a very profound influence on poultry leaders in all countries. Further, as the most impressive and important event

*Presented at the sixty-fourth annual meeting of the American Veterinary Medical Association, Philadelphia, Pa., September 13-16, 1927.

in poultry history, it is bound to exert a very great impetus on the development of the industry everywhere.

The reflection from all these important features of the Congress has already been felt in the United States, and it is my desire to take advantage of this reaction by presenting briefly what we as veterinarians must do to keep our flocks healthy in order that meat and egg-production shall not diminish. In any consideration of poultry disease control work, we must bear in mind that we are dealing with fowls, not only from a pathological standpoint but as commercial units on which a great industry is based.

The United States is the most important poultry-raising country in the world, producing more than one-third of the world's supply of poultry and eggs. The annual value of these products is considerably in excess of $1,000,000,000, amounting to about 16 per cent of the total value of live stock and its products for 1926 and being surpassed by only two other branches of the live stock industry—the dairy industry, with 40 per cent, and the swine industry, with 22 per cent of the total.

Poultry Industry Makes Rapid Strides

Although coexistent with the earliest career of the colonists of North America, the poultry industry up to comparatively recent times has constituted a rather incidental enterprise of the American farmer, usually managed by the housewife or children of the family. As a rule, the occurrence of disease under these conditions was either entirely unsuspected, as the fowls were allowed the run of the farm and shifted largely for themselves, or else regarded as of so little consequence as to merit no particular concern. An occasional dead hen was thrown unceremoniously into the hog-pen or perhaps left to lie where the unfortunate creature had expired, attended only by such obsequies as might be offered on the part of buzzards, rats or other disease-disseminating scavengers. The last decade, however, has witnessed an amazing change in the scope and methods of poultry and egg-production, as the industry has rapidly forged to the front line of dignified commercially productive enterprises. This development of the industry has been aptly termed one of the romances of our age. No longer is the humble hen an incidental, uninteresting and obscure member of the farm family, left to the chance fare that might fall to the ground from the corn-crib or manger, but she is in many instances a recognized asset, a chief source of income, and as such is pampered and favored with

the best of feed, shelter and attention. The legal recognition of the poultry industry has scarcely kept pace with its unprecedented growth in commercial importance. Laws of the land relating to live stock have frequently been so interpreted as relating only to domestic animals of the mammalian class but not to the feathered bipeds.

This lack of a legal status as regards the poultry industry has been one of its most serious handicaps. It is partially because of such a lack that, thus far, little definite information is at hand relative to the geographical distribution of various poultry diseases, nor are any statistical data available as to the ratio of mortality of any particular disease. In individual cases, such as that of avian tuberculosis, the Bureau has been able to engage in a rather extensive survey, with much valuable information forthcoming as a result. However, under the laws governing our activities the Bureau has thus far been restricted in its sanitary policing as regards the nation-wide poultry disease problems. Comprehensive and far-reaching control measures have been impossible of legal enactment or enforcement, and the keen solicitude of the nation's veterinary staff has been technically unable to find expression. In spite of these weighty handicaps, the young and vigorous industry has continued to press toward the fore, until at present out chickens are increasing relatively faster than our population.

European Fowl Pest

The highly beneficent possibilities latent in legislative enactments in favor of the industry were probably not fully visualized until such legislation became an urgent necessity. This occurred in the winter of 1924, when, for the first time, the European fowl pest was found to be prevalent within our boundaries with no public funds available for combating it. In response to urgent appeals, Congress promptly enacted emergency legislation empowering and financing drastic eradicative measures. A fine spirit of cooperation on the part of the various states involved, the poultry-raisers and the private concerns interested in the traffic in poultry, made possible a rapid and effective eradication of what threatened to be a nation-wide and possibly an age-long scourge. From a pathological standpoint control measures were relatively simple. They consisted essentially in inspection to detect infected and exposed fowls, prompt slaughter, disposal of dead fowls by burning or deep burial, and disinfection of premises

and equipment. Even though nine states, comprising altogether an area larger than some European countries, were involved, the outbreak was promptly eradicated. Moreover, the loss of affected fowls was negligible in comparison with the enormous poultry industry of the United States.

Yet the outbreak was sufficiently serious to show in a most convincing manner the importance of the nation's poultry industry and its intimate relation with other industries and public welfare. Owing to the risk in accepting live poultry in the affected regions, prices underwent a sharp decline and there was interruption in normal marketing, owing to the need for disinfecting coops, cars and sundry equipment. Altogether over 8,000 railroad cars were cleaned and disinfected during the outbreak. More than that, a number of poultry-killing establishments closed temporarily, throwing their employes out of work. Thus the influence of the poultry industry in many commercial fields is evident.

Combating such a poultry disease on a large scale involves adequate funds as well as a competent personnel, legal authority, equipment for cleaning and disinfecting, and the establishment of proper administrative procedure for doing the work promptly and thoroughly. In the instance cited, the Congress acted quickly, appropriating $100,000 to combat this deadly malady. This appropriation was the first which any Congress of the United States had made specifically for the actual field control and suppression of a poultry disease. That which has been done for fowl pest can be done for diseases in general which are inimical to the health of poultry. This fundamental postulate affords a motive which is itself finding expression and in the last appropriation bill Congress again recognized the importance of controlling poultry diseases. The Bureau this year was given authority to use funds for the control and eradication of poultry diseases as well as for the animal diseases specified in the past. Although no additional funds were appropriated, yet such specific recognition is gratifying and marks an important step in the effective control of poultry maladies. Fowls are now recognized as being worthy of the same official consideration as the larger domestic animals. This condition has come about in much the same manner that the various agricultural experiment stations and colleges have undertaken poultry work at dates usually later than similar work for horses, cattle, swine and sheep. We therefore venture the hope that, given the added assurance of a friendly

system of federal regulation, the poultry industry is on the eve of a new day of prosperity and development that will far eclipse its best achievement of former years.

Avian Tuberculosis

Essentially the same trend of sentiment is occurring in the attitude of the veterinary profession toward the poultry business. Formerly the value of a bird or even a flock was too small to justify the employment of a veterinarian for treating a diseased condition. It was cheaper and more expedient to destroy infected fowls than to treat them. Recently poultry diseases have received more and more attention and study. This is especially true of the infectious diseases. No discussion of the poultry industry would be complete without reference to the subject of avian tuberculosis. It was determined many years ago that the disease existed in poultry in some sections of the country to a considerable extent, and it was also known that it was transmissible to swine. However, it was not until bovine tuberculosis had been eradicated from a number of counties that a check upon the extent of its transmissibility to swine became possible.

In certain counties which, under the general plan of tuberculosis eradication, had been established as free from tuberculosis, checks were obtained upon shipments of swine sent to market centers, and it was ascertained that a greater percentage of tuberculosis was being found in these shipments of swine than had been anticipated. This led to a more detailed study of the poultry problem, resulting in investigations by Dr. L. Van Es, of the University of Nebraska, and others. These studies disclosed the fact that a much larger percentage of avian tuberculosis was being transmitted to swine than had been previously considered, due undoubtedly to the fact that avian tuberculosis itself had been stealthily increasing much faster than had ever been anticipated.

In connection with these studies, the Bureau established a system of flock inspection in connection with the testing of herds of cattle. It is interesting to note that last year 211,675 flocks, containing approximately 16,500,000 fowls, in 34 states, were inspected. Approximately 12,000 of these flocks, or 5.7 per cent, were found to be infected with tuberculosis. These inspections were made in the course of the routine testing of cattle. It is believed that the information disseminated to poultry-owners

through the medium of these inspections of flocks will prove of considerable value in the final control of the disease.

A questionnaire was also sent to several thousand poultry-owners through the Bureau field offices located in the respective states. More than 3,100 owners replied, 43 states being represented. The purpose of the questionnaire was to ascertain, if possible, under what conditions poultry flocks were being maintained, and the possible connection such maintenance conditions may have had with the transmission of the disease from flock to flock. A general study of all the figures afforded by the survey furnished the following conclusions: (1) That the poultry industry is not fully informed relative to avian tuberculosis and that much more educational work is vitally necessary; (2) that no definite conclusions can be deducted as to the most frequent mode of transmission of avian tuberculosis from flock to flock.

As a result of these inspections and surveys in connection with the incidence of avian tuberculosis, we know very closely the extent of this disease in every part of the United States. In fact this information has been mapped by counties and its national aspects may be seen at a glance. It discloses the fact that the eastern and southern states are comparatively free, but that in the middle western states, where almost 50 per cent of the nation's chickens are located, the disease exists to an alarming extent. The result of this knowledge emphasizes the necessity of control measures looking to the complete eradication of this form of tuberculosis. The states in which considerable infection exists have been actively preparing to inaugurate these measures, and I am glad to say that, with some variation in detail, a number of them are now embarked upon this campaign.

The control measures being adopted involve, in principal, the education of the poultry-raiser as to the need of sanitation and the best poultry husbandry methods; the physical inspection of the flocks; some tuberculin testing in ordinary farm flocks where a diagnosis can be obtained by no other means; the destruction of such diseased flocks; the cleaning and disinfection of infected premises; the careful selection of healthy birds; and the raising of new flocks on new or disinfected ground. It is realized, as was the case in the early stages of the bovine tuberculosis eradication work, that the methods will probably be improved from time to time. It is noteworthy also, as was the case with live stock organizations in the early steps of the bovine campaign, that the poultry organizations are lending their effort to the

stimulation of effective working plans. In order that the poultry-grower may have his attention drawn vividly to what avian tuberculosis is and how it may be eradicated, a moving picture entitled "Fowl Tuberculosis" is now being prepared by the Bureau for general distribution.

Bacillary White Diarrhea

Other poultry diseases also have received study of the Bureau of Animal Industry. While there is sometimes temporary chagrin in finding former methods and beliefs erroneous and undependable, I am confident that the poultry industry will gladly accept and apply the results of competent research in controlling disease. No disease problem is of greater moment than bacillary white diarrhea of chicks and its corollary the pullorum infection of hens. The former strikes a deadly blow at the very fountain-head of the industry's young life. A unified organization of state agencies responsible for the supervision and interpretation of standardized tests with proved antigens is essential for the accomplishment of definite, dependable results in controlling this most dangerous infection. This is merely a case of applying the same principle of protection to poultry that has been successful in human medicine and in treating the larger domestic animals. In this connection an outstanding event is the recent appointment of a Bureau committee to cooperate with a committee of the National Poultry Council in making an extensive study of white diarrhea, with the view of developing practical principles of control.

Parasitic Diseases

These necessarily brief remarks concerning bacterial diseases apply also to the numerous poultry ailments caused by parasites.

The subject of poultry parasites has received and is receiving a great deal of attention and investigation in general regarding parasitism as a highly important cause of losses among poultry. The losses are especially heavy among chicks, as are losses from parasites among young animals of all sorts.

Many workers have devoted most of their time to the more commonly recognized and widely distributed parasites, such as the large roundworm, the cecum worm, and the tapeworms. Since the limited resources of the Bureau will not permit any large amount of duplication of work done elsewhere, its energies have been devoted largely to investigations of parasites likely to be overlooked in routine examinations, and in connection with

this project it has already found a half-dozen worm parasites causing deaths and losses among chickens, turkeys, ducks, geese and pigeons. Because of their small size, or for other reasons, these highly pathogenic parasites had never before been found on this continent. A field survey in the South indicates that some of these parasites are widespread and important in that region, and other evidence indicates that some of them extend from the eastern coast to the Rockies. Doubtless they are widely prevalent over the country.

These findings represent two years' work, following up the preparation of a large monograph on the nematode parasites of poultry. Some of these parasites have very unusual life histories and methods of attack. The nematode, *Syngamus trachealis*, which causes the condition known as gapes, is one of the many parasites now catalogued in a scientific rogues' gallery in our laboratory. Turkeys very commonly harbor gape-worms and for this reason they are important sources of infection for young chicks, especially since turkeys themselves rarely show indications of the presence of the parasite. Yet when turkeys and chicks are reared together, there is difficulty in avoiding losses from gapes among young chicks. Such basic research is essential before it is possible to develop adequate control measures or even to recognize the presence of parasites now probably overlooked, even where they are destroying flocks. The growth and concentration of the poultry industry are increasing infections and parasitisms and our excellent transportation facilities are serving to distribute parasites and diseases far and wide.

Other Poultry Diseases

Time will not permit references to all the diseases which occur in the United States or to specific methods of their control. Some will respond to immunization measures. For instance, there are now on the market certain products which are being used successfully against such diseases as roup, diphtheria, and pox, but there are many factors which influence the degree of immunity produced. Such vaccines, of course, should not be used if any other infectious disease is present in the flock. This is one reason why such methods of preventive vaccination should be administered only by a veterinarian.

Research work in feeding has demonstrated the relative importance of protein, minerals and vitamins in rations for growing chickens and laying hens. Only a beginning has been made,

however, in respect to determining the proper balance among these proteins, minerals and vitamins. A tremendous field of research is open to the nutritional investigator in working to produce completely balanced and economical rations for our poultry and thereby eliminate many of our nutritional types of disease. The proper method of controlling these various nutritional diseases involves the necessity of distinguishing the symptoms and the application of the particular dietetic treatment appropriate to each form. Thus nutritional roup yields to the feeding of cod-liver oil, green feeds, egg yolk or butter fat, all of which are rich in vitamin A, while in rickets—a deficiency disease involving a faulty calcium metabolism—cod-liver oil in the early ration and later an allowance of shell or ground bone constitute the rational treatment.

Fundamental Principles of Control

In conclusion, I feel strongly that the most effective control of poultry diseases in the United States must be based largely on the efforts of poultry-owners themselves, which naturally would include the employment of the veterinarian skilled in poultry diseases. Such control is first an individual problem. And only when individuals can not or do not handle a dangerous situation is there need for governmental or state action. The objects of such action should be threefold: to protect domestic poultry from foreign contagion, to prevent the spread of poultry diseases from state to state, and to eradicate communicable diseases within a state when they appear.

These are essential functions for the protection of any state or country engaged in the production of poultry and poultry products, in order to conserve this valuable source of food and revenue. There can be no doubt of the mutual advantage that would come from closer cooperation in these matters.

Among the fundamentals which deserve special consideration are the following:

Each poultry-raising state should establish a competent veterinary poultry service, which should include poultry research laboratories and competent workers.

Laws and regulations should be framed with the object of preventing the spread of communicable diseases within a state, the transmission of infection from one state to another, and the introduction of infection from abroad. They should be based on

dependable scientific information and not on business expediency nor for the purpose of furthering commercial ends.

Thorough surveys should be made by the veterinary organizations of each state, at regular intervals, to ascertain what contagious diseases and harmful parasites are present in the state.

There should be an exchange of official information between states, at regular intervals, covering the results obtained through surveys and research work.

Funds should be constantly available to control or eradicate outbreaks of communicable diseases, especially the destructive foreign pests.

Meanwhile, the organization of the Bureau is whole-heartedly pledged to the fullest exercise of such functions as the Congress of the United States shall bestow upon us for the safeguarding of the poultry indsutry of the United States.

TWO GEMS

The best way to keep trespassers out is to adequately fill the field. If the practitioner is conspicuously better qualified than any other person to meet the veterinary needs of his community, the field is filled and not until then. The perpetuation of the profession and its elevation onto a higher plane is the responsibility of the veterinarian of today. We should be professional eugenists—we should now be selecting our successors. —*Program of Michigan State College Veterinary Short Course.*

The objects of this association are to promote good fellowship; to elevate the standards of veterinary education; to cultivate medical science and literature; to protect and promote the professional interests of the veterinarian; to direct public opinion regarding problems of animal hygiene; to contribute to the diffusion of true scientific knowledge among its members and increase the efficiency of veterinary service in the live stock industry.

—*Banquet program, Iowa Veterinary Medical Association.*

THE EARLY BIRD

Dr. Veranus A. Moore, of the New York State Veterinary College, Ithaca, N. Y., left on June 8, for California, to aid the University of California in organizing work on the infectious diseases of poultry and other animals.

—*American Veterinary Review*, July, 1903.

MANSON'S EYEWORM OF POULTRY*

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INTRODUCTION

The occurrence of Manson's eyeworm (*Oxyspirura mansoni* (Cobbold) Ransom) has been reported from various countries throughout the world, including China (Cobbold, 1879); Mauritius (Emmerez & Megnin, 1901); Australia (Johnston, 1910); Brazil (Magalhaes, 1888); Hawaii (Wilcox & McClelland, 1913); Jamaica and Florida (Ransom, 1904). In certain sections of Florida, Manson's eyeworm is of such frequent occurrence and of such economic importance as to make it desirable to study its habits and life history. For these purposes, experiments were begun in November, 1925.

MATERIALS AND METHODS

In order to make observations and to conduct experiments to the best advantage the work was carried out in a field laboratory, located in Manatee County. The conditions for poultry-raising in this portion of the State are typical for southern Florida, being in the midst of one of the most productive regions of this section.

For the chicken experiments twelve pens were constructed, four large living-pens and eight small insect-proof pens for the experiment birds and for the recovery of their feces. The eight small pens were constructed with one-half-inch wire platforms which permitted the feces to be collected beneath, on clean paper. For confining and raising the cockroaches, fifteen insect-proof cages were constructed.

ANATOMY OF THE EYEWORM

According to Ransom, the worms are white, with the customary slender thread-like form of the nematodes, and are attenuated at both ends. The attenuation is greater toward the posterior end, which is pointed, while the anterior end is rounded. Males may be distinguished from females by their generally smaller size, and by the tail, which is curved ventrally. The cuticula is very transparent and perfectly smooth. Magalhaes (1888, 1895) describes the cuticula as finely striated transversely, but Megnin (Emmerez & Megnin) remarks that there is no visible striation of the cuticula, nor have I seen such markings in any of a large number of specimens examined.

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The muscle fibers of the body-wall are plainly visible through the cuticula, under low magnification, as coarse longitudinal striations, and in favorable specimens much of the internal anatomy also is apparent.

On each side of the body, 350 to 400 microns from the anterior end, is a very small rounded cervical papilla, scarcely discernible, provided with a short projecting hair-like process, evidently a sense organ. A pair of very small conical papillae, each with a tiny opening, is situated near the tip of the tail in both sexes.

The mouth is circular or oval, and is surrounded by a chitinous ring, divided into six lobes by narrow clefts extending inward from the outer edge. These clefts correspond to the lateral and submedian longitudinal lines. Projecting from the surface of the head, near the outer edge of the ring and in relation with the clefts, are six small papillae to be distinguished only with difficulty and usually only when the head is viewed *en face* under a high power. On the sides of the head, posterior to the circle of papillae just referred to, are four papillae, which, from their position, may be designated sublateral papillae, as they are located midway between the lateral and submedian lines. The sublateral papillae measure 4 to 6 microns in length, and are slender and conical in shape. They project outward almost at right angles to the surface, and under a moderately high power are readily apparent in a lateral view of the head.

The excretory pore is situated in the ventral line at about the level of the cervical papillae; that is, 350 to 400 microns from the anterior end of the body.

Male: Cobbold gives the length of the male as five-eighths of an inch (about 16 mm.); Magalhaes (1888, 1895), 14 mm.; and Megnin (Emmerez & Megnin), 12 mm. The maximum length of the specimens which I have measured was 14 mm.; the minimum, 10 mm. Specimens of the latter length were clearly immature; 12 to 13 mm. being the usual size of mature worms. The diameter of the body is 50 microns at the anterior end, 200 to 350 microns at the middle, and 65 to 150 microns at the opening of the cloaca, which is situated 320 to 400 microns from the tip of the tail. As already mentioned, the tail is more or less curved ventrally and may describe one complete revolution of a spiral, or less. There are six pairs of genital papillae in the immediate neighborhood of the anal opening—two pairs postanal and four pairs preanal. Megnin (Emmerez & Megnin, 1901) mentions but five pairs of papillae; Magalhaes (1888, 1895), on the other hand, states that there are eight pairs—three postanal and five preanal. In the considerable number of specimens which I have examined there were in no case more or less than six pairs of genital papillae.

The papillae of the first and second pairs are situated a short distance on either side of the median line. The second pair is just posterior of the anus, and the first pair about 50 microns behind the second. The papillae of the third pair, adanal rather than preanal, are almost on a line with the anal opening, and are so far distant from the median line as to be sublateral in position. The fourth pair is 30 to 40 microns, the fifth pair 60 to 70 microns, and the sixth pair 100 to 130 microns, anterior of the anus. Of any two successive pairs, the fourth and fifth pairs are generally the nearest together, while the fifth and sixth are the farthest apart (the lateral distance which separates the papillae of the third pair from the others not considered). Passing forward from the first pair of papillae, which are the closest together, and leaving out of consideration the third pair, the lateral distance between the papillae of each pair gradually increases, reaching a maximum in the sixth pair, which are situated nearly on the submedian lines. The papillae of the sixth, fifth, fourth, second and first pairs are thus located on two converging lines which meet a short distance posterior of the anus. There is more or less asymmetry in the arrangement of the papillae, so that the papillae of any one pair are not always exactly opposite. Owing to this circumstance, it is sometimes difficult, from a lateral view alone, to determine the exact number of papillae and their arrangement into pairs. The spicules are often seen extruding from the anal opening. One of the spicules is long and slender, and the extruded portion may measure 1 mm. or more in length, while the other is short and thick and is only slightly protrusible. In no specimen

examined was there any evidence of lateral cuticular membranes in relation with the tail, as described by Megnin (Emmerez & Megnin).

Female: The females measure from 12 to 18 mm. in length, 50 microns in diameter at the anterior end, 400 to 430 microns at the middle of the body, 210 to 280 microns at the vulva, and 90 to 100 microns at the anus. The vulva is in the posterior part of the body, 1 to 1.4 mm. from the tip of the tail. It is an almost circular opening, 40 or 50 microns in diameter, surrounded by a very prominent raised border. The anus is situated 400 to 530 microns from the tip of the tail, and its location is frequently indicated by a small papilla-like swelling of the cuticula.

Nervous system: A nerve-ring surrounds the esophagus about 250 microns from the anterior end of the body. It is thus some distance anterior of the excretory pore. In the immediate neighborhood of the nerve-ring are a number of large cells with prominent nuclei, which, from their position, were interpreted by Magalhaes as ganglion cells. Some of them are smaller than the rest and stand in direct relation with the fibers of the nerve-ring. The remainder are arranged in four groups, corresponding to dorsal, ventral and lateral ganglia. The lateral groups are embedded in the substance of the lateral bands on each side of the nerve-ring. The dorsal group is composed of four or five pyriform cells, with processes extending to the body-wall in the dorsal line. The ventral group is largest, and extends from the nerve-ring to the excretory pore. In cross-section it is triangular, with the apex of the triangle joining the body-wall in the ventral line, while the base is closely applied to the ventral surface of the esophagus. Cells of similar appearance to the above occur in a group in each lateral band, opposite the terminal portion of the intestine, in both male and female.

The following nerves were seen: A prominent ventral and a small dorsal nerve, extending backward from the nerve-ring in the ventral and dorsal lines, respectively, and one or two nerves extending forward from the nerve-ring in each lateral band. The ventral nerve divides into two a short distance posterior of the nerve-ring, and the two portions, after passing one on either side of the common excretory canal, unite again on the median line.

Excretory system: The lateral bands extend the length of the body, and measure 15 to 20 microns in width. They have the usual structure, contain numerous nuclei, and through them run the longitudinal excretory canals, which unite posterior of the nerve-ring, and open by the common tube thus formed at the excretory pore.

There appears to be a connection posteriorly between the excretory canals and the openings through the small papillae, near the tip of the tail, already mentioned, but this relation could not be determined with certainty.

Muscular system: The muscles of the body-wall have the well-known polymyarian arrangement. A fan-like system of fibers is found in the tail of both male and female in relation with the terminal portion of the intestine. Beginning close together in the neighborhood of the anus, the fibers extend in divergent lines to attach to the dorsal wall of the body.

Digestive system: The circular or oval mouth opens into a chitinous mouth-capsule, or pharynx, in which two distinct portions may be defined, anterior and posterior, the former somewhat shorter and broader than the latter, and marked off from it by a prominent irregular ridge projecting forward on the inner surface. The pharynx is triangular in cross-section. Its length is 40 to 60 microns. The anterior portion measures 15 to 25 microns in length by 25 to 30 microns in width; the posterior portion 25 to 30 microns in length by 20 to 25 microns in width.

The esophagus, which begins at the base of the pharynx, is a thick-walled muscular organ with a narrow triradiate lumen lined by cuticula, and belongs to the filariform type. It is club-shaped, gradually increasing in size toward the posterior end. The diameter of its anterior end is about 40 microns; of its posterior end, 80 to 100 microns; and the length is about 1.5 mm. The posterior end is rounded and slightly bulbous, and at the extremity, which projects into the lumen of the intestine, prolonged into a rounded conical tip, without muscular elements and apparently composed entirely of chitin.

Except for irregular dilations, the intestine varies little in diameter during its almost straight course from esophagus to rectum and measures in that dimension from 50 to 100 microns. Its comparatively thin wall is composed of columnar cells about 8 microns in length, covered internally by a peculiar cuticular lining of the nematode intestine. The cells forming the wall of that portion of the intestine just in front of the rectum are larger and less closely crowded than elsewhere and the wall is thicker. In a ventral view of the female, this region of the intestine is seen to be sharply marked off from the rectum by a straight, transverse line.

The rectum tapers gradually toward its opening at the anus. Its wall is compact and lined inwardly by a dense layer of culticula. It measures 100 to 120 microns in length. The fan-like system of fibers extending from its terminal portion to the dorsal wall of the body has already been mentioned.

Male reproductive system: The testis begins anterior of the middle of the body as a slender cord, which makes a number of short loops backward and forward and graudally increases in diameter. It may extend into the anterior part of the body almost to the nerve-ring. From about the middle of the body, where it has attained a size of 50 to 60 microns, its further course backward is almost a straight line. About 1.5 mm. in front of the anus, there is a constriction which marks the beginning of the terminal portion, or ejaculatory duct. The wall of this portion is thick, composed of tall columnar cells, and the lumen is narrow. The portion immediately anterior of the constriction, with thin walls and wide lumen, serves as a seminal vesicle. The ejaculatory duct becomes smaller near its terminus and joins the intestine on the ventral side of the latter, 80 to 100 microns from the anal opening, to form the cloaca.

The long spicule measures 3 to 3.5 mm. in length by 8 to 10 microns in diameter; the short spicule, 200 to 220 microns in length by 30 microns in maximum thickness. The spicules are hollow. There is no opening through their rounded distal ends, while their proximal ends are squarely cut off and open. The short spicule may be compared roughly to a boat. On its ventral surface it has a longitudinal depression or groove, which serves as a guide for the slender spicule. The delicate transverse striation of the spicules is not superficial but affects their entire thickness. The spicules are situated on opposite sides of the cloaca. If the long spicule is on the right side, the short spicule is on the left side, and *vice versa*, and this relation varies in different individuals. Each spicule is surrounded by a close-fitting sheath, which opens into the dorsolateral side of the cloaca near its terminus. The walls of the spicule sheaths are well supplied with longitudinal muscle fibers, and a strong bundle of muscle fibers extends forward from the anterior end of each spicule attaching finally to the body-wall near the ventral line.

Female reproductive system: The female organs begin in the posterior portion of the worm as two slender tubes, the ovaries, which describe a number of loops in their course forward, and increasing gradually in size, are transformed into two large uteri filled with eggs in various stages of development. Besides lesser loops, each uterus describes a long loop, the two limbs of which extend nearly the entire length of the worm, so that in a cross-section near the middle of the body each uterus is cut twice. The bend of the long loop of the uterus is in the anterior part of the body. The two uteri ultimately unite in the posterior part of the body, about 1.5 to 2 mm. in front of the vulva, to form the vagina, which extends in a nearly straight course backward to the vulvar orifice. The vagina measures about 50 microns in diameter, the uteri about 100 microns in maximum diameter. The wall of the vagina increases in thickness posterial, due to the gradual accumulation of circular muscle fibers. The eggs are forced along the narrow lumen of the vagina in a single row, but in the uterus as many as 15 or 20 may be counted in a single cross-section.

Segmentation of the eggs does not begin until after the formation of the shells. At this time the eggs are much elongated, with rather square ends, and measure 24 by 12 microns. With progressing development the eggs increase in size and become more rounded, so that in the later stages, wherein the worm-like embryo is rolled up inside the shell, they are almost perfectly oval and measure 50 by 40 to 65 by 45 microns.

Examination of the Eye

The method employed in making examinations for the parasite consisted of anesthetizing the eye with a 5 per cent solution of butyn and lifting the outer margin of the nictitating membrane with a pair of finger forceps, exposing the tear-sac beneath the membrane in the inner corner of the eye. In case worms were present they could be seen wriggling violently beneath the membrane in the inner corner of the eye. In very severe infestations the worms were detected without the use of a local anesthetic by placing the fowl securely under the left arm, holding the head motionless with the left hand and, with the tip of the index finger of the right hand, pressing firmly over the tear-sac from within, outward over the eyeball. Worms thus pressed out on the surface of the eyeball immediately disappeared again beneath the nictitating membrane.

Experimental Data

Experiment 1: It seemed desirable to ascertain if the parasites passed from one eye to the other, so on January 17, 1926, a young fowl was obtained which showed a severe infestation of eyeworms. Repeated microscopical examinations of excreted material showed the presence of eggs. Both eyes contained numerous adult parasites. All the parasites which could be found in the left eye were transferred to the right eye, making a total of about sixty worms in the right eye. On the following morning the left eye was treated with a solution of creolin, in order to kill any parasites which might not have been removed on the preceding day. Upon making repeated examinations for about one month it was found that no worms passed from the right eye to the left.

Effect of nematode on host: After the bird had been under observation for about one month, the right eye suddenly showed a marked irritation which caused a disturbance of vision, shown by a continuous winking of the eye as if to dislodge a foreign body. Other symptoms noticed consisted of an apparent burning of the eye, evidenced by frequent rubbing of the head on the feathers of the wing, lacrimation, a nasal discharge, a white corneal opacity, and an inflammation of the nictitating membrane, together with a puffy elevation on this organ. This irritation caused the bird to scratch at the eye frequently with the foot, which produced laceration of the outer surface of the eyelids. The bird was immediately given a thorough clinical exam-

ination, with the result that no worms whatever were found in the right eye on this day, while on the preceding day, just before these symptoms occurred, numerous worms were present, as was determined by a careful examination. The worms therefore left the eye very suddenly, within twenty-four hours, and the symptoms just mentioned occurred in connection with their disappearance. A microscopical examination of the fecal material passed by this bird during the following twenty-four hours revealed the presence of hundreds of eggs and a few larvae. The eggs and larvae were carefully identified by comparing them with eggs obtained from sexually mature worms and larvae hatched from eggs of sexually mature worms. The irritation, produced by large numbers of worms in the eyes, was subsequently followed by inflammatory products, secondary infection, exfoliation of tissue, and the accumulation of such products of inflammation together with portions of decomposed worms and finally blindness.

Transmission of Eyeworm

Experiment 2: As the life cycle of Manson's eyeworm was unknown and as embryonated (coiled embryo) eggs of this nematode were passed in the feces, several tests were run to ascertain if transmission of the worms from one chicken to another occurred by means of the embryonated eggs. On December 14, 1925, twelve sexually mature female worms were removed from the eye of a chicken and placed in normal salt solution. A few hours later these worms were teased into bits by the use of a tenaculum and forceps, thereby setting free a large number of eggs containing embryos. These eggs were placed in the eyes of six pullets. Repeated observations were made, but no evidence of an infestation could be found. At the close of five months, the birds were destroyed and upon a detailed postmortem examination no eyeworms could be detected.

On December 18, 1925, eggs containing embryos were introduced far down the trachea of each of six birds, by means of a long pipette. These birds were destroyed five months later and each of them was given a postmortem examination, with the result that no evidence of eyeworm infestation could be found. From the results of these tests it appeared that transmission of Manson's eyeworm from one chicken to another was not by means of embryonated eggs.

Experiment 3: To ascertain if healthy birds could be infested by placing recently hatched larvae in the eye, and in the trachea, the following tests were carried out: On December 30, 1925, six mature female worms were removed from the eye of an infested chicken and placed in distilled water. A few hours later these worms were teased into bits and a large number of embryonated eggs secured. The culture was kept at room temperature and protected from light. Two days later, no appreciable change had occurred in the development of the eggs, but on the third day a great number of them had hatched. A large number of these recently hatched larvae, about 0.2 mm. in length, were placed in the eye of one chicken and in the trachea of another chicken. Repeated observations over a period of five months were made to determine if infestation could occur from placing newly hatched larvae in the eye and in the trachea, but in no case did an infestation result.

Experiment 4: The next problem attacked was that of exposing non-infested birds to infested chickens in the same cage, to see if the worms could be transmitted by contact. In this experiment four infested and four healthy birds were used. The non-infested birds were confined with the infested ones in an insect-proof cage for a period of five months. Sanitation similar to that given an average farm poultry flock was maintained. Under this condition the non-infested birds were therefore exposed to the active living stage of the parasite and to the contaminated cage. No infestation was transmitted from infested to healthy birds in this manner. Neither could eggs or larval forms of the parasite be found in the bronchial or nasal secretions of infested or exposed fowls.

The result of this experiment led to several inferences, such as (1) the elimination of immature, non-infective stages of the parasite; (2) the need of a period of incubation in the soil or water longer than the exposure allowed in the experiment; (3) that adult parasites are not transmitted directly from one bird to another; and (4) the existence of an intermediate host.

An attempt was then made to determine if there was an intermediate host which transmits the eyeworm. Consequently, attention was directed toward various insects which are encountered on premises where infested chickens were ranging. It appeared reasonable to suspect the "stick tight," or southern chicken flea, as being a possible intermediate host, since a portion of the life history of the flea is spent in feeding upon and crawling

in organic material, including the droppings of birds and in later life collecting in clusters near the eyes of chickens. A microscopical examination was therefore made of numerous fleas collected from chickens severely infested with eyeworm, with the result that no evidence of transmission by this insect was obtained. Likewise in these experiments, mites, lice, water crabs, flies, earthworms and crickets taken from infested premises were examined without finding the larvae.

In making examinations of infested flocks it was observed that decidedly more severe infestation existed where the birds roosted out in trees, or under sheds or other places about the runs, where only an occasional or no disposal of the droppings was made and where boards, weeds, grass, or trash were present in the lots and

FIG. 1. Larvae of Manson's eyeworm, taken from body of cockroach.

FIG. 2. Adult Manson's eyeworm.

runs and at the bases of the trees. An examination of the soil in the moist, shady portions of the runs beneath the boards and trash or in the grass at the edges of the fences revealed the presence of numerous cockroaches (*Pycnoscelus* (*Leucophaea*) *surinamensis* Linn.)

These cockroaches hid beneath the boards and trash and among the loose, moist soil or any dark place during the day and at night they came forth and fed upon whatever food material was available, including feces of chickens. An examination of these roaches, found on premises where infested chickens ranged and roosted, showed the presence of larvae resembling the eyeworm.

Examination of the Cockroach

In examining the cockroach for larvae, the insect was chloroformed and pinned on its back, one pin being placed in the region of the head and another in the anal region. The feet were removed and the ventral abdominal segments carefully dissected away, one at a time, exposing the underlying adipose tissue and organs. The organs of the thoracic region were also exposed by dissection. Then with the aid of a dissecting microscope, or a hand lens or even with the unaided eye, the cysts could be seen imbedded in the adipose tissue or along the course of the alimentary canal. Each cyst contained a larva which varied in size according to age. Placing the adipose tissue and the abdominal

Fig. 3. The intermediate host of Manson's eyeworm, the cockroach, *Pycnoscelus* (*Leucophæa*) *Surinamensis* Linn.

and thoracic organs in a Petri dish containing a small amount of water often facilitated locating the deeply situated cysts.

When the more mature cysts were thus exposed, the encysted larvae, stimulated to vigorous movements, freed themselves from the cysts, wriggled about in the water or hid from the light beneath the tissues. Few or many cysts were present in the body-cavity. In numerous instances a great number of cysts were situated in cluster-like formation around the posterior intestine, while at other times only two or three were found in the same roach.

Dissection of roaches later in the season revealed that some larvae were no longer in the cysts but had released themselves

from the capsule and were free in the body-cavities and legs of the roaches and in this stage they were at the height of infectivity.

Experiment 5: Having found nematode larvae in the bodies of the roaches, the next step was to ascertain if the larvae would migrate into the eyes of the chickens. Mature larvae, placed on the surface of the head near the eye of a chicken, began immediately to wriggle violently and soon some of them found their way into the moist eye, where they disappeared by their own movements or were carried out of sight by the opening and closing of the nictitating membrane. After placing the more mature larvae in the eye, examination showed that some located in the inner canthus, in the tear-sac, beneath the nictitating membrane. When large numbers of young worms about 8 to 9 mm. in length were placed in the eye, many passed into the mouth through the naso-lacrimal duct and wandered around for a time, after which they again located in the tear-sac.

Experiment 6: In order to determine if these larvae were those of the eyeworm and if they would remain in the eye, several tests were carried out. The chickens used in these experiments were seven-weeks-old White Leghorn cockerels, which were hatched in an incubator and kept on premises where no eyeworm had been detected. After careful examination which showed that they were free from eyeworm, the birds were confined for six weeks in insect-proof cages built especially for this purpose.

(1) Twelve larvae, varying from 4 to 8 mm. in length, were removed from the bodies of several cockroaches (*P. surinamensis*) and placed near the right eyelids of chicken 401. A number of these larvae migrated to the surface of the eyeball and immediately disappeared beneath the nictitating membrane. On the following morning, twelve larvae, from 4 to 7 mm. in length, were placed in the left eye of the same fowl. An examination of the tear-sac of the right eye of the bird at this time showed that the young worms were still present. (2) Nine larvae were removed from the bodies of two cockroaches and placed in the left eye of chicken 402; likewise on the following day sixteen additional larvae, varying from 4 to 8 mm. in length, were placed in it, making a total of twenty-five larvae in the left eye of this bird. Frequent examinations were made on the following days and these observations showed that the largest larvae remained in the eye, while apparently the smaller larvae, about 4 mm. in length, were unable to do so. (3) Twenty-one larvae were placed in the eyes of chicken 493. Later examinations of the tear-sac showed

the presence of eyeworm and on a microscopical examination of the feces of this bird, two months later, eggs of the eyeworm were detected. (4) Four larvae were transferred from a cockroach to the left eye of chicken 404. Two months later, one dead worm was removed from this eye and three living worms were present. The right eye was negative.

Thus it is seen from experiment 6 that the larvae found in these roaches remained in the eyes of the chickens located in the tear-sac and produced infection.

Experiment 7: This experiment was run to ascertain the fate of the larval worms when they gained entrance to the mouth of chickens. Eleven larvae were removed from the body of a cockroach and placed, one at a time, on the roof of the mouth and on the tongue of chicken 405. Immediately upon touching the warm, moist mucous membrane of the mouth, these larvae began to make vigorous snake-like movements and all succeeded in gaining entrance to the slit-like posterior nares and disappeared. A later examination of the eyes of this bird showed that some of the larvae had migrated to the tear-sac of the right eye, while others gained access to the left eye. The result of this experiment therefore shows that the young worms, after being freed in the mouth of the chicken, migrated to the eyes and located beneath the nictitating membrane.

After the above observations had been made, the report of Fielding (1926) was received. This investigator stated that he had found the same species of roach to be the intermediate host of eyeworm of Australian poultry.

Experiment 8: In order to determine if infestation of the eyes would occur from feeding infected roaches, six tests were made. (1) Chicken 408 was fed six partly dissected and broken roaches. Eyeworms were later found in the tear-sac beneath the nictitating membrane of both right and left eyes. The fowl died several days later. (2) The above test was repeated on bird 408. After feeding the roaches, the presence of eyeworms was noted in the tear-sac beneath the nictitating membrane of both the right and left eye. (3) Chicken 401 was fed ten whole roaches, care being taken not to rupture them while they were being introduced into the crop. An examination of the eyes on the following day showed the presence of eyeworms. (4) Chicken 411 was fed ten whole roaches which had been dead for 24 hours. On the following day a close examination revealed the presence of numerous eyeworms. (5) Chicken 413 was fed ten live roaches, care being

taken to introduce them into the crop without rupturing them. On the following day the eyes of this fowl were considerably inflamed and upon a careful examination the presence of numerous eyeworms was detected. Six controls were negative. (6) Chicken 419 was fed four live unbroken roaches, between 9:00 and 9:01 a. m. From seven and one-half to eight and one-half minutes later, worms were seen in the mouth; two minutes later, some of the worms were at the posterion nares; and at 9:20 a. m., worms were present in the right eye. On this occasion, worms were seen issuing into the eye through the naso-lacrimal duct.

The results of experiment 8 show that infestation of the eyes may be produced by feeding infected roaches.

Experiment 9: To ascertain the fate of the larvae within the dead intermediate host, two tests were made. (1) Ten roaches were killed and placed in a moist chamber. Forty-eight hours later, eyeworms were seen protruding and wriggling from the leg of one roach and from the body of another roach. (2) Several roaches which had been dead for forty-eight hours and kept in a moist chamber were placed in a moist vial, and this vial containing the roaches was then placed in a water-bath, temperature 107° F. Thirty minutes later, numerous worms were wriggling about on the inner walls of the vial, showing that the larvae lived forty-eight hours after the death of the roaches and that they were able to leave the bodies of the roaches.

Experiment 10: This experiment was carried out to determine if some of the larvae would pass further than the crop and be lost. Chicken 415 was starved for eighteen hours and then given four live roaches, followed by a small amount of mash and water. Forty minutes afterwards, a postmortem examination was made and eyeworms were recovered from the following organs in the numbers and condition indicated.

Organ	*Number of Worms*	*Condition*
Gizzard	43	Dead and partly broken
True stomach	2	Alive; 4.5 and 9 mm. long.
Second portion of esophagus	1	Alive; 9 mm. long.
Crop	15	All alive and varying in length.
Esophagus	3	Alive; 8.5, 9 and 8.5 mm. long.
Trachea	1	Alive; 9 mm. long.
Right eye	14	Alive; from 8 to 9 mm. long.
Left eye	12	Alive; from 8 to 9 mm. long.

From this experiment it is seen that a large percentage of the larvae passed into the gizzard and were destroyed.

Experiment 11: It was thought that various wild birds might be capable of spreading the disease, consequently five tests were made. (1) Two live roaches were fed to a blackbird (*Agelaius phoeniceus phoeniceus* Linn.) at 10:42 a. m., and at 10:51 a. m. worms were seen at the base of the tongue. Thirty minutes after feeding the roaches to this bird, both eyes were infected. Two controls were negative. (2) Five bobolinks (*Dolichonyx oryzivorus* Linn.) were fed a number of roaches and placed in an insect-proof cage. All five became infested in both eyes. The control was negative. (3) Two roaches were introduced into the mouth of a pigeon at 2:00 p. m., and at 2:30 p. m. both eyes were infested with worms. A microscopical examination of the nematodes 75 days later showed that the worms were sexually mature, and a microscopical examination of the feces at this time showed the presence of eggs. The pigeon was kept in an insect-proof cage. (4) A loggerhead shrike (*Lanius ludovicianus ludovicianus* Linn.) was given three cockroaches and placed in an insect-proof cage. Forty minutes later both eyes were positive for eyeworm. The control was negative. (5) Four roaches were fed to a bluejay (*Aphelocoma cyanea* Vieillot). An examination of the eyes one hour later showed the presence of worms. The bird died 104 days after being put on the experiment. A few hours after the bird had died, four sexually mature eyeworms were removed from the right eye. A microscopical examination of the intestinal contents of the jay revealed the presence of eyeworm eggs.

The above experiment leads to the belief that various wild birds are capable of becoming infested, thereby giving roaches in remote places access to infected droppings.

Development: Following are notes on the development of the eyeworm. Some of the nematodes in the eyes of the experiment birds were removed at various intervals in order to make observations on their development. Thirty days after the infestation had occurred, the sex organs were well developed but lack of eggs showed that the worms were not wholly mature. Forty-eight days after infestation, a dead worm was taken from the eye of a bird. The uterus was broken down and numerous eggs, many of which contained the coiled embryo, occurred throughout the length of the body. At sixty days after infestation, eggs were recovered from the feces of a fowl. However, this period varied in other birds, according to the development of the worms at the time of infection.

Sexually mature male and female worms occur in the inner canthus of the eye, beneath the nictitating membrane. Here the female worms lay embryonated eggs. The eggs are washed down the tear-duct, with the eye-fluid, into the pharynx and are swallowed. Some of the eggs may hatch in the intestinal canal but most of them pass from the body with the feces, where hatching occurs in a variable length of time. How the embryos reach the body-cavity of the cockroaches is unknown. Here further growth and development takes place after which the larvae free themselves from the capsule and wander around in the body-cavity, legs, etc., of the roach. The roaches are readily eaten by chickens and the larval eyeworms contained in these insects having gained a position in the mouth, pass into the eye through the naso-lacrimal duct. In case the roaches are swallowed whole and the larvae reach the crop of the fowl, they free themselves from the intermediate host and migrate up the esophagus into the mouth, thence to their destination through the tear-duct. They reach sexual maturity in the tear-sac, beneath the nictitating membrane, and lay their eggs. Experiments are now being conducted to determine the mode of entrance of the larval worms to the body-cavity of their intermediate host.

The Cockroach

According to Zappe (1918), the cockroach (*P. surinamensis*) is circumtropical in distribution, extending its range frequently into subtropical regions. It is abundant in the peninsula of Florida and the Brownsville region of Texas. It has been found established as far north as Jacksonville, Gainesville and Cedar Keys, Florida; New Orleans, Louisiana, and San Antonio, Texas. Elsewhere in the United States the species has become temporarily established in greenhouses and places similarly heated during cold weather. It has been taken in the reptile-house of the New York Zoological Society, in New York City; also at Rutherford, N. J., Washington, D. C., and Cromwell, Conn. An immature specimen taken from a bunch of bananas has been recorded from Toronto, Ontario. This species and also the Australian cockroach (*Periplaneta australasia* Fabr.) have been reported as doing damage in a conservatory at Wellesley, Mass.

Outside of the United States, *P. surinamensis* has been taken in Cuba, Bahamas, Porto Rico, Dominica, Trinidad, Barbados, Martinique, Grenada, St. Vincent and Jamaica, islands of the West Indies; Bermuda, Mexico, Costa Rica, Brazil and Guiana,

on the American continent; Sumatra, Lombok and Java of the East Indies; Philippine Islands, Lower Siam, Singapore, Straits Settlements, Amoy, Southern China, Senegal and, according to Fielding, in Australia.

Treatment of the Eyeworm

The treatment recommended by Wilcox and McClelland (1913) for destroying eyeworms in the tear-sac of infested birds has been modified somewhat for use in these investigations. The treatment consists of anesthetizing the eye by means of a local anesthetic (5 per cent solution of butyn) and, after exposing the worms in the tear-sac by lifting the membrane, placing one or two drops of a 5 per cent solution of creolin directly on the worms beneath the membrane. The eye should then be immediately irrigated with pure water to wash out excess creolin solution. The worms die immediately upon coming in contact with the creolin solution and therefore irrigating the eye does not interfere with the effectiveness of the treatment. Birds so treated will stand around for a time in the shady portions of the runs with their eyes closed; they open their eyes, however, when feed is offered and, in forty-eight or sixty hours after the treatment, the eyes are in a better condition than when infested with a large number of worms.

Control of the Eyeworm

In view of the widespread occurrence of the cockroach (*P. surinamensis*) throughout tropical and subtropical countries, it seems impossible to rid premises completely of this insect for any great length of time. The favorite hiding-places of this species should be removed as far as possible, hence all trash, loose boards, boxes and filth should be removed from the houses, lots and the premises kept in a sanitary condition at all times. Where daily sanitary disposal of all droppings is maintained, the gross infection of roaches is less general and the severity of the disease is proportionately lessened. It has been observed on premises where severe outbreaks occurred that thoroughly treating the eyes, maintaining strict sanitary disposal of the droppings and clearing the runs of all trash, filth, loose boards, boxes, etc., results in controlling the disease to such an extent that it is of little economic importance.

Summary

1. Manson's eyeworm (*O. mansoni*) is a parasitic nematode found beneath the nictitating membrane of the eye of poultry.

2. A severe eyeworm infestation will often result in blindness.

3. Embryonated eggs of *O. mansoni* are not infective when placed in the eyes of chickens.

4. The newly hatched larvae likewise are not infective when placed in the eyes of chickens.

5. The adult parasites are not transmitted directly from one bird to another.

6. Larvae resembling *O. mansoni* may be found in a species of cockroach (*P. surinamensis*) on premises where infested birds range and roost.

7. Infestation of the eyes has been produced within twenty minutes after feeding *P. surinamensis*.

8. The larval eyeworms, after being swallowed along with the intermediate host, reach their destination by migrating up the esophagus to the mouth, thence through the naso-lacrimal duct to the eye.

9. After gaining entrance to the tear-sac, the larval worms develop to sexual maturity and lay eggs.

10. Hens are frequently seen tearing apart large roaches for their chicks. This would seem to account for the presence of mature or almost mature worms in the eyes of very young chicks.

11. Data from experiments showed that the following wild birds are capable of becoming infested and may spread infected droppings: blackbird (*Agelaius phoeniceus phoeniceus*), bobolink (*Dolichonyx oryzivorus*), loggerhead shrike (*Lanius ludovicianus ludovicianus*), Florida jay (*Aphelocoma cyanea*) and the pigeon.

12. The most effective treatment used to destroy the worms in the eye consists of anesthetizing the eye with a 5 per cent solution of butyn and then lifting the nictitating membrane and placing one or two drops of a 5 per cent solution of creolin directly on the worms. Immediately after instilling the creolin, the eye should be irrigated with water.

13. The most efficient control measures observed up to the present time consist of thoroughly treating the eyes and putting into practice strict sanitary measures, especially including the disposal of the droppings at short intervals and clearing the runs of all trash.

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VETERINARIAN OPENS POULTRY LABORATORY

Dr. S. S. Worley (Wash. '22) recently opened a laboratory in Bellingham, Wash., where he expects to specialize in poultry pathology. During the past three or four months he has been running the bacillary white diarrhea test for poultrymen and hatchery associations in the vicinity. His work has covered about eighty thousand birds and he feels there is a good field for such a laboratory.

He will aim to carry a good line of poultry remedies of known value along with such antiseptics and drugs as the business requires. He will also handle such small-animal work as may be represented.

STATE BOARD EXAMINATION

Arkansas Veterinary Examining Board. Old State House, Little Rock, Ark. Feb. 10, 1928. Dr. Joe H. Bux, Secretary, Old State House, Little Rock, Ark.

NEURITIS OR PARALYSIS IN CHICKENS*

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Neither neuritis nor paralysis is an entirely satisfactory designation for the disease under consideration. The term neuritis fails to be satisfactory mainly because there are evidently cases of the disease in which the pathologic process is limited to the central nervous system. The term paralysis is too restricted to include the well-defined cases of the disease in which the pathologic process is limited to nerves of the viscera, such as the splanchnic and vagi nerves. There are a good many of these cases in which there is not any recognizable paralysis. The terms neuritis and paralysis combined are not comprehensive enough to cover the cases of iritis and iridocyclitis which have such a close flock association with the more strictly neuropathologic conditions. In fact the flock association of chronic iritis with neuritis, myelitis, and encephalitis is so nearly constant as to make it highly probable that they are all etiologically identical.

The great importance of paralysis or neuritis is evident to persons who have been observing the increasing prevalence of the disease. A number of poultry pathologists are now of the opinion that it is one of the most important diseases affecting chickens. Practical poultrymen have already recognized the seriousness of the disease and are asking for help in its control.

SYMPTOMS

Since the disease is essentially a disease of the nervous system, the symptoms shown by an affected bird depend upon what part of the nervous system is attacked. Paralysis of the legs and wings is a common symptom. Ataxia frequently precedes more pronounced symptoms of paralysis and myelitis. The brain and the nerves of the head are sometimes attacked in such a way as to produce a variety of symptoms, such as walking backward, giddiness, twisting of the neck, and even lethargy. Gasping, without any recognizable respiratory obstruction, is a common symptom when the vagi are involved.

The eye symptoms are essentially those of an iritis and iridocyclitis. The peculiar grayish color of the iris and its fixed

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condition give the eye an appearance which poultry-raisers sometimes refer to as "glass eye." The corneal surface is frequently abnormally convex, as if the intraocular pressure were increased.

Gross Pathology

The amount of gross change which the disease produces is quite variable. The essential gross changes are found in the nerve trunks, plexuses, spinal ganglia, and sometimes in the brain. Gross changes in the spinal cord are difficult to detect. However, swollen spinal ganglia can usually be taken to mean that there are also pathologic changes in the cord.

The gross changes in the nerve-trunks, plexuses and spinal ganglia consist of swelling and grayish coloration. Sometimes practically the entire nerve-trunk is swollen; while in other cases only short segments of the nerve show any recognizable change. In some instances nearly every nerve-trunk in the bird's body shows well marked gross lesions. In other cases the visible change is limited to small portions of a few nerves. The vagi and splanchnic nerves show well-defined gross lesions in a large proportion of the cases. The encephalitis cases sometimes show recognizable yellowish-gray foci, particularly in the cerebrum; and an apparent increased pressure on the cerebral fluid.

Microscopic Pathology

The striking histologic feature of the disease is a round-cell infiltration of the nerve-trunks, plexuses, ganglia, spinal cord and brain. Of course, round-cell infiltration of all these various parts of the nervous system is not present in every case. Routine examination of various tissues from cases of the disease has shown myelitis to be very common. Leptomeningitis is also rather common. In fact, microscopic lesions are sometimes found in the central nervous system and even in sympathetic nerve-trunks and ganglia from birds which do not show clinical symptoms suggestive of the disease.

The infiltrating cells in the brain, cord, and meninges have a well-defined perivascular arrangement. In the nerve-trunks, the infiltrating cells sometimes have a patchy arrangement which may be determined by the location of the blood-vessels. In a great many cases, however, the cross-section of nerve-trunks is found to be packed full of the infiltrating cells.

Microscopic sections of the eye from cases of iritis or iridocyclitis show the iris and ciliary body to be markedly infiltrated with round cells.

The Cause

When we consider the pathology of this disease, we are forced to conclude that it is caused by a neurotropic virus of some kind. The microscopic changes which occur in the nervous tissue in this disease are very similar to the changes which occur as the result of certain infectious diseases in man and some of the lower animals. We have not been able to find any agent in the tissues, by cultural or staining methods, with sufficient constancy to make any demonstrable microorganism appear significant so far as the cause is concerned.

Transmission of the Disease

In inoculation experiments, in which we used baby chicks from a flock which was never known to be affected by the disease, we did not reproduce it by injecting triturated nervous tissue, from typhoid cases, intracranially, intraocularly, intraperitoneally, intramuscularly and subcutaneously, We have reproduced the disease, however, by merely breeding from an experiment flock in which there had been cases of paralysis and in which there were cases of iritis. Several of the birds hatched from eggs laid by the affected flock developed typical paralysis, with well-marked neuritis and myelitis, before they were two months of age. One bird developed the disease at 47 days of age. Control birds, from a flock in which the disease was never known to have occurred, have not shown evidence of neuritis or paralysis during a period of six months. We have observed the disease to occur in a control bird after it had been associating intimately with iritic and neuritic birds for eleven months. This, of course, does not exclude the possibility of birds developing the disease earlier in life as the result of infection acquired through cohabitation.

We have repeatedly observed the disease to occur for the first time in flocks following the introduction of birds from affected flocks. We have also observed the disease to develop in birds which were obtained as day-old chicks from affected flocks and then raised in new houses on new ground.

The observations which we have made regarding the spread of neuritis or paralysis in the field indicate that the important factor in its dissemination is the sale of breeding stock, baby chicks, or eggs for hatching, from a flock in which one or several birds have shown symptoms and lesions of this disease.

SANITARY MEASURES FOR THE CONTROL OF BACILLARY WHITE DIARRHEA*

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Bacillary white diarrhea of chickens has been reported by animal disease investigators in all sections of the United States and Canada, where poultry production is an important industry. The results of diagnostic tests of breeding flocks and postmortem examinations of young chicks indicate that this is a common disease of chickens, and in the light of present knowledge of pullorum infection in breeding and farm flocks, we may consider bacillary white diarrhea the most important infectious disease with which poultrymen have to deal.

IMPORTANCE

It has been pointed out by poultry disease investigators and poultry specialists that the greatest economic loss resulting from pullorum infection occurs in young chicks; and that this is supplemented by stunted growth, and reduced egg-production and hatchability of eggs. *Bacterium pullorum* belongs to the paratyphoid-enteritidis group of bacilli, certain members of which are capable of producing gastrointestinal disturbances in man. The possibility of raw or partially cooked eggs, that contain large numbers of *Bact. pullorum*, producing such disturbances when eaten, has been suggested by Rettger, Hull and Sturgis. These investigators fed eggs infected with *Bact. pullorum* to rabbits, guinea pigs and kittens and produced food-poisoning in the experiment animals.

TRANSMISSION

In 1909, Rettger and Stoneburn isolated *Bact. pullorum* from the ova of the ovaries of hens, and the yolk-sacs of chicks within the shell. Later, Rettger reported having found *Bact. pullorum* present in the ovaries of a pullet that was one of a lot of chicks that lived through an outbreak of the disease; thus identifying the laying hen as the ultimate source of bacillary white diarrhea. Doyle found 2.6 per cent of the eggs laid by 14 infected hens to

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contain *Bact. pullorum*. Jones reported experiments that showed the transmission of the infection in three ways: first, through the egg; second, by direct contact with pullorum-infected chicks; and third, by placing chicks in contaminated quarters. It has been demonstrated by a number of investigators that chicks a few days of age pick up the infection when allowed to associate, either directly or indirectly, with chicks that are passing *Bact. pullorum* in the droppings. It is generally considered that the presence of *Bact. pullorum* in the droppings ceases and the high susceptibility of the chick is reduced after the young bird is two or three weeks of age. Mathews failed to find *Bact. pullorum* in the droppings of pullorum-infected hens. However, field data show that mature birds may become infected. It is very possible for the disease to spread in an infected flock through mature hens feeding upon eggs that are accidentally broken in the nest or about the buildings and yards.

The Blood-Serum or Agglutination Test

The blood-serum test for the diagnosis of bacillary white diarrhea in mature birds was first reported and the technic described by Jones, in 1912. He recommended a three-tube test. Each tube contained three cubic centimeters of test fluid, and the serum dilutions were 1 to 50, 1 to 100, and 1 to 200. The antigen used was faintly cloudy and prepared from freshly isolated strains of *Bact. pullorum*. In 1916, Rettger, Kirkpatrick and Jones recommended a one-tube test for use in large flocks, and a serum dilution of 1 to 100.

Although the one-tube agglutination test is generally used, the technic recommended by Jones and his co-workers has been simplified in order to facilitate the testing of large numbers of birds, and to increase the personnel that may be available for testing breeding flocks. The effect of any radical change in the technic on the accuracy of the blood-serum test should be determined before recommending it for general use by practitioners. A series of tests on several thousand hens should be made, and the reacting birds, as far as possible, slaughtered and examined for pullorum infection. Any loss of young chicks that may occur in the tested flocks should be investigated and the cause of the loss determined, if possible.

The majority of poultrymen and a few animal-disease investigators consider bacillary white diarrhea of little economic importance, and the agglutination test an erratic diagnostic test

for this disease. This attitude of poultrymen toward the control of bacillary white diarrhea is to be expected at this time, but it is difficult to understand the questionable position taken by trained pathologists, and their attitude toward the results of the investigational work that has been done by Rettger, Jones, Gage and others.

Control Measures

Gage and Flint state that the elimination of bacillary white diarrhea from a breeding flock depends on two factors: first, the finding of infected birds through the application of the blood-serum test; secondly, the removal of these birds from the flock and the protection of the growing flock from infection. One without the other is practically useless, and unless the poultryman follows a definite plan of disease control and eradication from year to year, he will not be successful in eliminating the disease from his flock.

Individual poultrymen and practicing veterinarians, and not poultry associations and organizations, as is the case in a few states, have given their support to the control of bacillary white diarrhea in Indiana. Poultrymen who have had their flocks tested have considered the advantages of the test from the standpoint of advertisement and disease control. The hatcheryman may have the flocks, from which he is collecting eggs for hatching, tested because it helps him to sell chicks; and the breeder and flock-owner may be interested in the test, largely because it is a disease control and eradication measure. Naturally, we are more deeply intersted in the latter attitude toward the purpose of the blood-serum test.

Flock Testing in Indiana

When we first began testing flocks, the difficulty of interesting poultrymen and veterinarians in the economic importance of bacillary white diarrhea and the control of the disease was very apparent. Poultrymen believed that lack of constitutional vigor, wrong methods of feeding and care, and brooder pneumonia were responsbile for the high death-rate in young chicks. For a period of six or seven years, from 1917 to 1924, educational meetings were held, flock-owners and veterinarians were given service in the diagnosis and control of poultry diseases, and a large number of flocks were tested for the purpose of demonstrating the efficiency of this method of preventing loss in chicks,

and determining the accuracy of a one-tube blood-serum test that we had developed and used in testing experiment birds.

In January and November, 1924, veterinary short courses or conferences were held for the purpose of instructing practicing veterinarians in the technic of the agglutination test, and the diagnosis of the important communicable diseases of poultry. These short courses are now held annually, and include discussions of the symptoms, pathology, and measures for the prevention and control of the important infectious diseases of domestic animals. Two hundred and fifty veterinarians have attended one, or all, of the conferences and short courses. This past season about 60 veterinarians tested flocks for bacillary white diarrhea. A few practitioners collected blood samples and turned them over to other practitioners who completed the test. However, the majority of veterinarians made complete tests, or tested blood samples collected by poultrymen. Individual veterinarians tested from a few thousand to twenty-three thousand birds.

This past season, about 20 per cent of the birds in breeding flocks reacted to the first test, 12 per cent to the second, and 9 per cent to the third. There were very few flocks in which no reactors were found. Most of the testing for bacillary white diarrhea is done in sections of the State and in flocks where heavy losses of chicks have occurred. A veterinarian, who tested about 20,000 birds during the breeding and hatching season, reported a decided decrease in the number of reactors in flocks that were tested the preceding year, where the owners removed the reactors and practiced sanitary measures as a part of his flock management. The few exceptions that he reported occurred in flocks that had fowl typhoid.

The low mortality in chicks from tested flocks gives a better impression of the disease control work that the veterinarians are doing than does the percentage of reactors found in breeding flocks that have been tested in two successive years. This low mortality is generally interpreted by poultrymen to mean that a breeding flock from which the hatching eggs came is free from bacillary white diarrhea. Sometimes, only the pullets are tested. This was practiced several seasons by the owner of one of the best breeding flocks in the State. Strange as it may seem, she escaped chick losses for three seasons. This season she changed veterinarians, and the death-rate in the chicks was so serious that it became necessary for her to cancel all orders. The vet-

erinarian whom she had previously employed tested the entire flock in April and found a heavy percentage of reacting birds.

Attached to a form letter, used for reporting the results of the laboratory examinations of young chicks that show pullorum infection, is the following questionnaire:

(1) Were these chicks hatched from eggs from your own flock?.....

(2) Has your breeding flock been tested for bacillary white diarrhea?.....

(3) If so, when?.....

(4) Give the name of the veterinarian who tested the flock.....

(5) Were these chicks from a hatchery that advertised "chicks from blood-tested hens?.....

Poultrymen are requested to fill out the above questionnaire, and this request has been complied with in a large percentage of cases, and especially where the chicks are from "blood-tested flocks."

In most cases of pullorum infection in chicks, the hatcheryman or breeder is requested by the purchaser to replace the chicks. This request is usually followed by the hatcheryman questioning the diagnosis, or reporting the condition or conditions that he believes are responsible for the outbreak. The following causes are usually given: buying eggs for hatching from untested flocks in order to supply the demand for chicks; failure to remove the reacting birds; setting eggs from untested pullets from flocks that are considered free from bacillary white diarrhea; and feeding non-fertile eggs from the incubator. It is very possible that custom hatching, so commonly practiced, is responsible for a large percentage of the outbreaks that are reported.

There are a large number of hatcherymen who do not believe in testing breeding flocks for the purpose of controlling bacillary white diarrhea. They believe that whenever the death-rate in a lot of chicks is unusually high, the cause is faulty management, or brooder pneumonia. However, this general attitude toward the cause of high mortality in chicks is gradually changing because of the growing demand for disease-free chicks. The hatcheryman who sold good, healthy chicks had no difficulty in disposing of the output of his hatchery this past season. although there was an overproduction of hatchery chicks. We believe that this is the most important factor in promoting "disease-free flocks of high vitality and marked constitutional

vigor," which is the poultryman's description of the ideal breeding flock.

Laboratory Service

One veterinarian on our staff gives all of his time, and others part time during the hatching season, to answering poultry-disease inquiries and the postmortem examination of young chicks. This service work enables us to keep in touch with the results of the testing of breeding flocks. Although chicks were received from more than 1000 outbreaks of bacillary white diarrhea this past season, only a small percentage of these cases could be traced to careless testing by veterinarians.

We find that it is very difficult to collect statistics that give the distribution and occurrence of poultry diseases, or to make a disease survey by sending questionnaires to poultrymen and veterinarians, and by interviewing them. Veterinarians seldom keep disease data, and most poultrymen are too conservative and not well enough informed to furnish accurate information. The data contained in field and laboratory reports, when compiled at the end of each fiscal year, give the most reliable poultry disease survey that is available.

The advisability of members of state departments giving their time to routine laboratory work, such as the postmortem examination of poultry and reporting the results of these examinations, is sometimes questioned. We must admit, however, that the educational phase of this service is very important at this time, because of the need of a better appreciation of the relation of a correct diagnosis to the control of communicable diseases of poultry.

Our interest in the blood-serum test for the diagnosis of bacillary white diarrhea is largely educational. Poultrymen do not realize the economic importance of this disease, and we can not expect them to cooperate in a serious effort to eliminate pullorum infection from breeding flocks. This plan of interesting veterinarians in the control of bacillary white diarrhea is the one that is generally followed in the control of several common infectious diseases of farm animals.

Tourist (in village store): "Whaddya got in the shape of automobile tires?"

Saleslady: "Funeral wreaths, life preservers, invalid cushions and doughnuts."—*Extension Magazine.*

ATYPICAL SALMONELLA PULLORUM AGGLUTINATIONS CAUSED BY BACTERIAL CONTAMINATION

By W. R. HINSHAW *and* G. L. DUNLAP

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INTRODUCTION

There are very few poultry-disease investigators who discredit the value of the agglutination test for detecting carriers of *Salmonella pullorum* infection (bacillary white diarrhea). However, there are a few who seem to think that, because laboratory workers located in different sections of the country cannot agree when testing serum from the same birds, that the test should be condemned. Beach[1] reported on tests made at several laboratories and concluded that the agglutination test was inefficient. The authors cooperated with Beach in his work, but do not agree with him that the test is inefficient. We admit that there are discrepancies, but believe that until a better test has been developed, that ways to improve rather than condemn the agglutination test should be sought. It is not the purpose of this article to discuss this point, but to give one possible reason for disagreements in interpreting results such as Beach has reported.

For the past two years the writers have been studying the causes of atypical agglutinations which are often mistaken for typical reactions unless one is experienced in differentiating them. In many of these cases partial reactions have been observed in low dilutions of blood serum (1-20) and, when retests were made, negative reactions would often result. Records kept on a flock of birds which never gave a reaction above a 1-20 dilution, and which were not consistent in these reactions, suggested that some factor other than specific agglutinins was the cause of some of the apparently typical agglutinations. Their reactions were either partial or, if complete, the flocculent material was very finely divided. Smears made from the agglutination tubes showing such reactions consistently showed large numbers of a Gram-positive coccus. The control tube containing only antigen was never found to be contaminated with the organism, which was apparently growing in the tubes containing serum and antigen, even though the antigen was preserved with

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0.3 to 0.5 per cent phenol. The contaminating organism was never found in tubes containing above 1-80 dilutions of blood-serum.

In many cases the organism was observed to be growing in the bottom of the test-tube, forming pin-point colonies, which radiated from the center of the concavity of the tube outward. Slight to no cloudiness of the supernatant fluid was noticed. When shaken, the colonies went into suspension, but did not break up, and were easily mistaken for agglutination by one not recognizing their presence. The *S. pullorum* cells in suspension seemed to be all or partially precipitated in these contaminated tests.

No attempt to study this coccus was made until recently, when it began to appear in a large number of partial or weak reactions in some cooperative tests. An attempt was made to isolate it from several sources and to determine its natural habitat. The writers believe that this is one of the causes of discrepancies reported by various cooperating laboratories and hope that the brief description which follows will aid others to study further this possible cause of so-called partial, weak and border-line reactions in the routine agglutination tests.

Habitat of the Organism

As was mentioned in the introduction, the coccus which has been found to be the cause of atypical agglutinations, by growing in serum-antigen mixtures, was first observed in the low dilutions of these mixtures. It has not been isolated from pure-culture antigens. A short time ago several strains were isolated in pure culture from samples of chicken blood-serum which had been preserved for a week with 0.5 per cent phenol. The agglutination tests from these samples gave weak reactions and the same organism was isolated from the tests before we attempted isolation from the sera. These samples arrived at the laboratory three days after they had been taken from the birds and were kept in the ice-box (10°C.) except when being sampled. The sera appeared clear and showed no macroscopic indications of being contaminated.

We have failed to isolate this organism from the heart-blood of birds whose blood-serum, when collected by the usual method of bleeding, yielded the organism after incubation for 24 hours in the serum-antigen mixture. The coccus has been isolated from

the skin of these same birds. Therefore it would seem that the natural habitat is the skin of birds.

DESCRIPTION OF THE ORGANISM

The description given below is of one of the strains isolated from serum shipped from Illinois and preserved with 0.5 per cent phenol. This report is only a preliminary one and the description is not intended to be complete. No attempt has been made to classify or name the organism.

Source: Isolated in pure culture, July 4, 1927, from chicken blood-serum shipped from Urbana, Illinois, about May 29, arriving at Manhattan, May 31, 1927. The serum had been removed from the blood-clot at Urbana and preserved with 0.5 per cent phenol. There was no appearance of contamination at the time the serum was used in the test, but the agglutination tests from this serum gave an atypical reaction, which might be considered a weak reaction to *S. pullorum* antigen, after incubation for 24 hours at 37°C.

Morphology and staining: Spheres, arranged singly, in pairs, and in groups of four; average from 1.3 to 1.5 microns in diameter; no capsules observed although not stained by special methods. Stains readily with ordinary anilin dyes and is positive to Gram's stain. Non-motile, as observed by hanging-drop and dark-field methods. There is a tendency to form irregular clusters when grown on solid media.

Cultural Characteristics: (Incubated at 37°C.)

Agar stroke: Growth, scanty; beaded, glistening, slightly raised, surface smooth.

Agar stab: Growth papillate, more abundant near the surface.

Nutrient broth: Flocculent, slight clouding; abundant, compact sediment.

One per cent dextrose broth: Growth similar to that in nutrient broth but more profuse. Has greater tendency to settle out in 48 hours to 60 hours.

Agar colonies: Growth slow, colonies punctiform in 24 hours, circular in 48 to 72 hours; elevation, convex; edge, entire.

Physiology: Aerobic and facultative anaerobe. Acid without gas in meat-infusion broth containing 0.5 per cent dextrose, maltóse, lactose, saccharose, mannose, levulose, galactosé, dextrin, arabinose, rhamnose and raffinose. No acid or gas in same type of media containing inulin, salicin, xylose and dulcitol. Sugar-free meat-infusion media made from chicken meat were

used in these tests. The media were made sugar-free by inoculation with *B. saccharolyte*. Brom-thymol-blue was used as an indicator. Durham fermentation tubes were used in making the cultures.

Discussion

Pure cultures of a coccus which agrees with the strain described have also been isolated from atypical agglutination tests on blood-serum from birds 194, 205, 260, 262 and 266. The same organism was also isolated from the blood-serum from which these tests were made. All the blood samples in these cases were obtained by puncturing the wing vein after the usual method for obtaining blood samples from birds. No disinfectants were used on the skin previous to puncturing the wing veins, but ordinary precautions regarding cleanliness were observed.

Similar cultures have been isolated from the skin of these birds, but in no case has the organism been isolated from blood removed aseptically from the heart. Repeated attempts to isolate the organism from the antigen used in these studies have failed. Therefore, it would seem that the source of the contamination is the skin of the birds.

Means to overcome such contamination have not been studied in detail. Blood removed aseptically seems to reduce the chance of contamination from this source and, from this standpoint, Martin's[2] method of withdrawing blood samples may be of value. Disinfection of the skin with lysol or some other reliable disinfectant is another suggestion.

Since 0.3 to 0.5 per cent phenol does not inhibit growth of this organism in agglutination tests incubated at room temperature, ice-box incubation, or incubation at a temperature higher than the maximum growing temperature has been suggested. Booth[3] reported excellent results with ice-box incubation. The authors have compared results on a few samples at 20°, 37°, 40°, and at 50°C. on a few samples where atypical results have been experienced. More work needs to be done to determine the efficiency of the 40° and 50°C. incubation temperatures, but so far the results have been very encouraging. The coccus has failed to grow at these temperatures, and more clear-cut reactions on negative sera have resulted.

The rapid method for making agglutination tests described by Runnells *et al*[4] also can probably be used to advantage. With this test the reaction occurs so rapidly that there is no

time for contaminating organisms to grow and cause atypical reactions.

Finding a more efficient preservative than phenol for use in agglutination testing will also probably help to eliminate the difficulty.

CONCLUSIONS

No attempt has been made to name the organism described, since this is only a preliminary report. The purpose of reporting at this time is to call attention to a factor of possible error before this season's testing starts. It is hoped that laboratory workers experiencing similar difficulties will cooperate in finding methods of improving the present technic to overcome the difficulties.

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PENSACOLA PROTECTS FOOD SUPPLY

The city of Pensacola, Fla., now has a municipal abattoit, opened October 1, 1927. Inspection work is conducted by Dr. C. C. Rayfield. All meat slaughtered locally is given inspection and all meat that is shipped into the city for sale is given re-inspection.

Pensacola has had milk inspection for the past two years, also under the supervision of a veterinarian, Dr. E. L. Reed.

OREGON VETERINARIANS USE BOOKLET

The Oregon Veterinary Medical Association procured a booth at both the Oregon State Fair and the Pacific International Live Stock Show and distributed the booklet, "Nothing To Sell But His Services." In the booklet was placed a list of all graduate veterinarians in the state of Oregon and their addresses.

A MAJOR OPERATION

"Did the doctor remove your appendix?"

"Feels to me like he removed my whole table of contents."

American cooperation has passed the emotional stage and settled down to business, where it belongs.

—*The Stockman and Farmer.*

FURTHER STUDIES ON DISSEMINATION OF SALMONELLA PULLORUM INFECTION IN INCUBATORS*

By W. R. HINSHAW, H. M. SCOTT *and* L. F. PAYNE

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INTRODUCTION

The data reported in this paper were obtained from a series of eight experiments, conducted to check the work of Hinshaw, Upp and Moore.[1] In the experiments reported by these authors, normal chicks, exposed in a forced-draft incubator to artificially infected chicks and chick-down, contracted bacillary white diarrhea. The work was criticized because of the limited quantity of data and also because artificially instead of naturally infected chicks were the source of infection.

Weaver[2] has reported similar experiments in which naturally infected chicks served as a source of infection for normal chicks hatched in the same incubator. He reported a mortality of 70 per cent from bacillary white diarrhea among the exposed chicks, while none of the control chicks hatched in another machine died from this disease.

PROCEDURE

Source of eggs: Normal eggs were obtained from a flock of 200 Rhode Island Red pullets which had been tested by the agglutination test and found free from bacillary white diarrhea prior to collecting the test eggs. This same flock was tested six months later and found free from this disease. The second test was applied between the fourth and fifth hatches. Infected eggs were obtained principally from a flock of 60 females known to be positive reactors to the agglutination test. These birds were tested monthly from June, 1926, to June, 1927. Individual agglutination titres of these birds ranged from 1-20 to 1-5280. Both flocks were trap-nested and fed alike but confined in separate pens. Some infected eggs were obtained from 20 reacting females not trap-nested but tested monthly by the agglutination test during the same period of time as the above group.

Two lots of normal eggs, at least one tray of each, were placed in opposite ends of a forced-draft-type incubator. One or more

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trays of eggs from reacting birds were placed beside the normal eggs in one end of the incubator. One lot of eggs from the non-reacting birds was also hatched in a non-forced-draft machine. The control eggs and the exposed eggs were from the same disease-free stock. The following outline shows the arrangement of eggs for incubation:

GROUP	SOURCE OF EGGS	POSITION OF EGGS IN MACHINE
I	Normal birds	Same end of machine as infected birds
II	Normal birds	Opposite end of machine from groups I and IV
III	Normal birds	Hatched in separate machine
IV	Reacting birds	Same end of machine as group I, but in separate trays.

Candling and hatching: The experiment was repeated eight times. Hatches 1, 2, 3 and 4 were taken off approximately 16 days apart, on the following dates: January 4, January 20, February 3 and February 20, respectively. Hatches 5, 6, 7 and 8 were taken off on May 30, June 14, June 30 and July 16.

In order to bring off a hatch every 16 days, it is obvious that the eggs of two hatches would be in the machine at the same time. At the conclusion of a hatch, the eggs of the following hatch were placed before an electric fan to remove the chick-down, and not again placed in the machine until it was thoroughly disinfected and dried.

All eggs were candled on the eighteenth day and all infertiles, dead embryos and cripples from group IV were saved, to be examined bacteriologically. A hatching record was kept of each hen which furnished eggs for group IV. This record gives the number of eggs set, infertiles, and embryos which died in the shell. In some instances eggs from the latter group were not identified, due to the pipping of the chick and loss of markings on the shell. The chicks were not pedigreed.

Disinfecting of equipment: Brooding and incubating equipment were thoroughly cleaned and then sprayed with a two per cent lysol solution, using a compressed-air sprayer to apply the disinfectant. As previously stated, at the end of each hatch, the eggs still in the incubator for the succeeding hatch were taken out and the chick-down removed by exposing them to a 15-inch electric fan. The trays were kept in a warm room until the incubator was thoroughly disinfected. Brooder equipment was not used for 48 hours after it was cleaned and disinfected.

Handling of the chicks: All chicks were removed from the incubators 12 hours after the peak of the hatch had been reached and placed in new clean chick-boxes. When removed from the machines care was exercised to handle the different groups in the following order: III, II, I and IV. This precaution eliminated the possibility of transferring infection from chicks of group IV to those of any other group.

Brooding: Chicks were held in boxes for 60 hours, toe-punched, and then removed to electric brooders in rooms different from the one in which they were hatched. The type of experimental chick-brooder similar to the one described by Garrick[3] was used to brood the chicks for two weeks. Two of the brooders were located in one room and the third in another. Groups I and II were brooded beneath the same brooder, separated by a solid partition. Since both groups were exposed to infection in the incubator, this was deemed practical. The room containing the two brooders was L-shaped, with dimensions of 18 feet by 30 feet. The shortest distance between the two brooders was five feet.

In the first three hatches, group IV was brooded in the same room as groups I and II but in opposite corners. Group III was brooded in the second room. In the last five hatches the positions of groups IV and III were reversed. This was done to safeguard groups I and II from any chance spread of infection made possible by flies and propinquity.

Rations and management: Chicks were first given a drink of buttermilk and then fed a chick scratch composed of:

60 pounds cracked yellow corn
20 pounds steel-cut oats
20 pounds cracked wheat.

Grain was fed five times daily for the first week. On the eighth day, chicks were allowed to have access to a mash composed of:

30 pounds wheat bran
30 pounds wheat shorts
25 pounds yellow corn meal
10 pounds meat scraps
5 pounds mineral mixture
2 pounds cod-liver oil.

At this time two of the grain feedings were discontinued. In feeding and caring for the chicks they were handled in the same

order as described for removing from the incubator. The doors of the two rooms were locked to prevent the handling of chicks by any one except the person in charge.

Every precaution was taken to see that the chicks became acquainted with the brooder as a source of heat and that they hovered properly about the brooders at night.

Autopsy of chicks: All dead chicks were removed from the brooders promptly and either autopsied at once or placed in the refrigerator to be examined within 24 hours. Cultures were

TABLE I—*Summary of mortality records of exposed chicks*

Group I. Chicks hatched from normal eggs incubated adjacent to eggs from reacting hens, but in different trays

HATCH	NO. OF CHICKS	TOTAL MORTALITY	DIED OF B.W.D.		DIED OF OTHER CAUSES	
			NUMBER	PER CENT	NUMBER	PER CENT
1	55	0	0	0.0	0	0.0
2	56	10	3	5.35	7	12.50
3	63	30	26	41.27	4	6.35
4	47	43	42	89.36	1	2.13
5	36	3	0	0.0	3	8.33
6	51	36	29	56.86	7	13.72
7	47	25	25	53.18	0	0.0
8	45	28	22	48.88	6	13.33
Totals	400	175	147	36.75	28	7.00

Group II. Chicks hatched from normal eggs incubated in opposite end of incubator from eggs of reacting hens

1	59	1	0	0.0	1	1.69
2	60	21	11	18.33	10	16.67
3	70	21	14	20.00	7	10.00
4	53	20	13	24.52	7	13.20
5	48	0	0	0.0	0	0.0
6	48	16	15	31.25	1	2.08
7	52	9	8	15.38	1	1.92
8	51	26	21	41.17	5	9.80
Totals	441	114	82	18.59	32	7.25

taken from the livers, unabsorbed yolks, and lung lesions when present. All cultures isolated from the dead chicks were studied and identified by means of fermentation reactions and stained mounts. Eighty strains were further studied serologically and checked against known *S. pullorum* cultures.

RESULTS

The results of mortality for the four groups are summarized in tables I and II. It is evident from a study of these results

that during the eight hatches no losses from bacillary white diarrhea occurred among the 637 control chicks in group III. The average mortality for the control chicks was 7.53 per cent. (See table II.)

The mortality from bacillary white diarrhea among the exposed chicks (groups I and II) varied from hatch to hatch and in two hatches there was no loss due to this disease. In both hatches when no losses from bacillary white diarrhea occurred among the

TABLE II—*Summary of mortality records of control and reactor chicks*

Hatch	No. of Chicks	Total Mortality	Died of B.W.D.		Died of Other Causes	
			Number	Per Cent	Number	Per Cent
Group III. Chicks hatched in separate machine (eggs from non-reacting hens)						
1	131	2	0	0	2	1.52
2	85	11	0	0	11	12.94
3	119	11	0	0	11	9.24
4	103	11	0	0	11	10.68
5	57	2	0	0	2	3.51
6	52	1	0	0	1	1.92
7	54	4	0	0	4	7.40
8	36	6	0	0	6	16.66
Totals	637	48	0	0	48	7.53
Group IV. Chicks hatched in same end of machine as group I (eggs from reacting hens)						
1	42	2	0	0.0	2	4.76
2	97	29	18	18.55	11	11.34
3	92	35	30	32.61	5	5.43
4	122	87	81	66.39	7	5.73
5	42	3	0	0.0	3	7.15
6	77	18	14	18.18	4	5.19
7	51	15	14	27.45	1	1.96
8	80	27	24	30.00	3	3.75
Totals	603	216	181	30.01	36	5.97

exposed chicks, no losses occurred in group IV, hatched from supposedly infected eggs. The average mortality due to bacillary white diarrhea in group I was 36.75 per cent and in group II, 18.59 per cent. The average mortality in these groups due to other causes was 7.0 and 7.25 per cent respectively.

DISCUSSION

In six of the eight hatches, bacillary white diarrhea was transmitted to normal chicks. The fact that no losses from bacillary white diarrhea occurred among the exposed chicks in two hatches

may be explained by the failure of the disease to develop among the supposedly infected chicks. Infection apparently was not present in these two hatches since there were no losses from the disease in group IV. At the end of the two-weeks brooding period, these chicks were normal in every respect. Seventy-five normal pullets, selected from the four groups in these two hatches and reared in confinement, were in heavy egg-production six months after hatching.

TABLE III.—*Individual hatching record of 46 trap-nested reactor birds**

Birds Laying Infected Eggs				Birds Laying Non-Infected Eggs			
No.	Eggs Set	Eggs Hatched	Per Cent Hatched	No.	Eggs Set	Eggs Hatched	Per Cent Hatched
252	47	28	59.57	6693	30	20	66.66
1257	11	4	36.36	6793	35	6	17.14
6764	26	10	38.46	7053	9	7	77.77
7056	30	14	46.66	7059	32	18	56.25
7057	77	49	63.63	7088	23	8	34.78
7058	32	12	37.50	7114	61	41	67.21
7074	57	21	38.59	7115	27	15	55.55
7078	27	4	14.81	7119	31	25	80.64
7081	12	3	25.00	7122	7	1	14.28
7142	5	1	20.00	7136	35	6	17.14
7145	29	11	37.93	7143	29	18	62.06
8063	21	3	14.28	8363	2	0	0.0
8383	56	29	51.78	8365	37	21	56.75
8396	25	7	28.00	8378	41	17	41.46
8419	44	7	15.90	8422	15	7	46.66
8425	48	21	43.75	8427	3	0	0.0
8503	20	4	20.00	8429	24	11	45.83
8512	7	1	14.28	8459	2	0	0.0
8669	35	8	22.85	8510	15	0	0.0
8915	23	13	56.52	8601	54	38	70.37
8958	31	23	74.19	8667	43	20	46.51
				8670	42	19	45.23
				8673	19	3	15.78
				8675	55	21	38.18
				8678	1	0	0.0
Totals	663	273	41.17		672	322	47.91

*Per cent laying infected eggs, 45.65; per cent laying non-infected eggs, 54.35.

Similar results in practice have puzzled hatcherymen and poultrymen for some time. It is not uncommon for poultrymen to have heavy losses from the disease in one brood and to have normal mortality in the following brood, hatched in the same machine, from eggs of the same stock.

Some light may be thrown upon the failure to transmit the disease to normal chicks in hatches 1 and 5 by a careful study of tables III, IV, V and VI. There is every evidence that chance

TABLE IV.—*Summary of the bacteriology of eggs examined from groups I, II and III*

GROUP	HATCHES	EGGS EXAMINED	EGGS INFECTED	
			No.	%
I	1–8	131	0	0.0
II	1–8	130	0	0.0
III	1–8	168	0	0.0
Totals		429	0	0.0

TABLE V—*Summary of the bacteriology of eggs and embryos examined from group IV*

HATCH	No. EXAMINED	INFECTED	
		No.	%
1	57	11	19.29
2	96	17	17.70
3	142	6	4.22
4	165	15	9.09
5	94	11	11.70
6	161	10	6.21
7	87	10	11.49
8	69	11	15.94
Totals	871	91*	10.44

*Includes nine unidentified cultures.

TABLE VI.—*Summary of individual hens laying infected eggs*

Hen	EGGS EXAMINED	EGGS INFECTED	
		No.	%
252	16	6	37.50
1267	6	5	83.33
6764	16	4	25.00
7056	16	3	18.75
7057	24	1	4.16
7058	19	1	5.26
7074	28	1	3.57
7078	22	4	18.18
7081	7	1	14.28
7142	3	3	100.00
7145	16	1	6.25
8063	17	1	5.88
8383	27	7	25.92
8396	18	2	11.11
8419	35	25	71.42
8425	20	2	10.00
8503	15	3	20.00
8512	6	3	50.00
8669	25	2	8.00
8915	10	2	20.00
8958	8	5	62.50
Totals	354	82	23.13

plays an important role in the transmission of the disease. If infection is present in the machine, positive results may be obtained and, if not present, the reverse will be true.

Of the 46 trap-nested reactor hens recorded in table III, only 45.65 per cent produced infected eggs and of 871 eggs examined from these hens only 10.44 per cent were actually infected. Since very few infected eggs ever hatch, one can readily see the role played by chance.

Such results indicate a very important fact, namely, that the removal of 99 per cent of the reactors from a flock will not always prove satisfactory in eliminating the disease, for the one per cent remaining may lead to disastrous results.

Many instances have been called to the attention of the writers, in the field, where such results have occurred. Patrons of hatcheries have had their eggs custom-hatched and would lose a high percentage of the chicks from bacillary white diarrhea, while chicks hatched in their own incubators were normal. Such instances suggested the incubator as a possible source of infection.

The history of bird 8419 is the most interesting of the 46 reactors used in these experiments. This Rhode Island Red hen's agglutination titre limit was 1-2560. She was a consistent reactor to the agglutination test. From all outward appearances she possessed normal vigor. Forty-four eggs were set from this hen and only 15.9 per cent hatched. Of her eggs examined, *S. pullorum* was found in 71 per cent. The ovary was badly diseased. Figure 1 shows that normal ova were entirely absent and that the entire ovary was degenerated. Twelve ova from this bird, examined bacteriologically, yielded pure cultures of *S. pullorum*.

The histories of birds 252 and 1267 are likewise interesting. Both reacted up to a dilution of 1-2560. Eggs examined from both birds yielded a high percentage of *S. pullorum* cultures. Upon autopsy, the ovary of bird 1267 was found to be badly degenerated, although seven large and apparently normal ova were visible. Twelve ova examined yielded 12 cultures of *S. pullorum* (fig. 2). The ovary of bird 252, outside of a few ova, appeared to be perfectly normal, but upon examination eight ova yielded eight cultures of *S. pullorum* (fig. 1).

It is the opinion of the writers that by far the greater portion of the infection observed in these experiments originated from

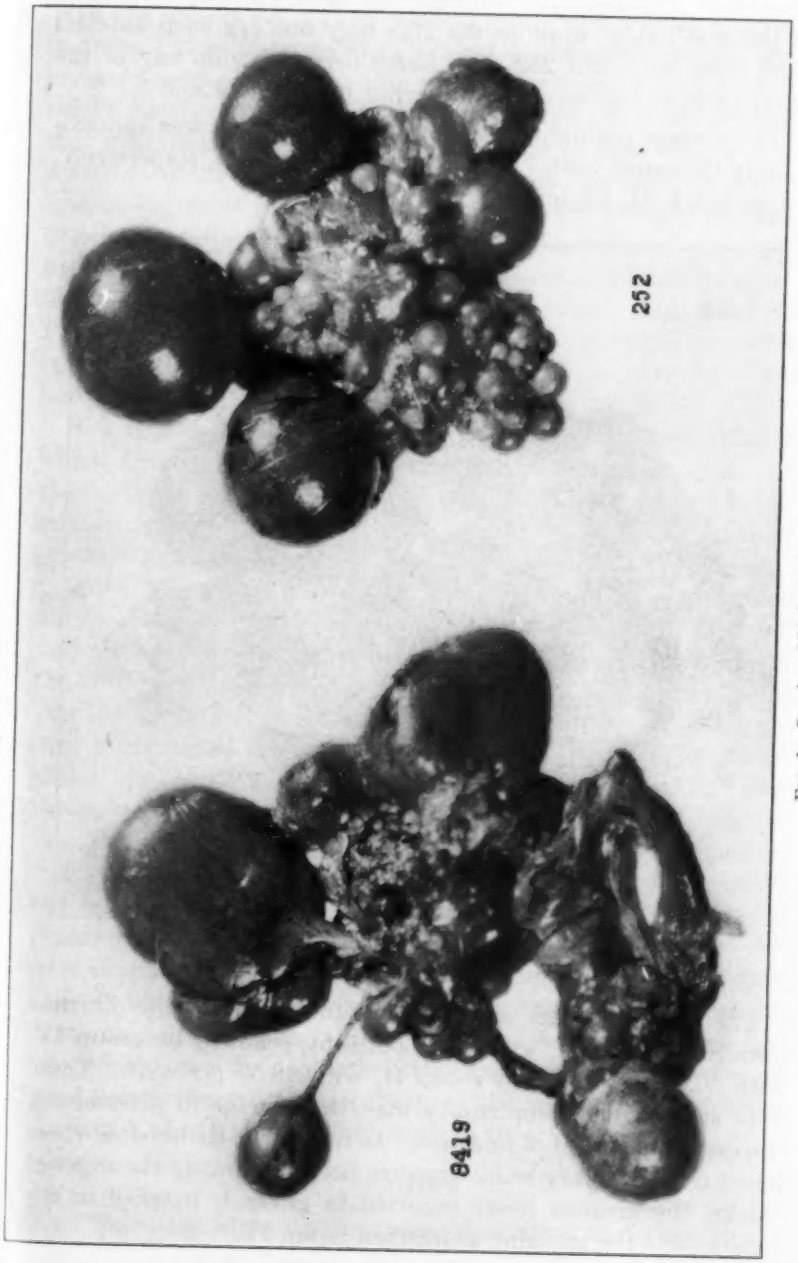

FIG. 1. Ovaries of birds 8419 and 252.

hens 8419, 1267 and 252. No eggs from these three birds hatched in the first hatch, while in the fifth only one egg each hatched from birds 8419 and 252. No losses occurred from any of the groups due to bacillary white diarrhea in hatches 1 and 5.

The average normal mortality of the four groups was approximately the same: 7.00, 7.25, 7.53 and 5.97 per cent, respectively, for groups I, II, III and IV.

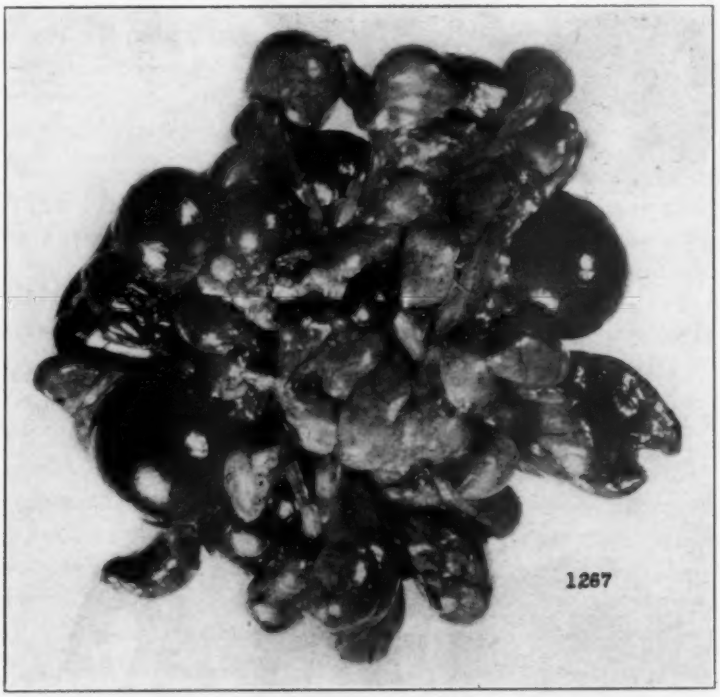

FIG. 2. Ovary of bird 1267.

The highest average mortality due to bacillary white diarrhea occurred in group I, with 36.75 per cent; followed by group IV, with 30.01 per cent and group II, with 18.59 per cent. These data suggest that propinquity may be a factor in determining the degree of spread of infection. In five of the six hatches where losses from bacillary white diarrhea occurred among the exposed chicks, the greatest losses occurred in group I, hatched in the same end of the machine as infected group IV.

When hatches 1 and 5 are not considered, the loss due to bacillary white diarrhea in group I was 47.57 per cent; in group

II, 24.55 per cent; and in group IV, 34.89 per cent. Considered from this standpoint, a 12.68 per cent greater loss was experienced in group I than in group IV. While it is difficult to explain why greater losses occurred in this group of exposed chicks than in chicks hatched from reactor eggs, Beaudette's[4] work showing that agglutinins for *S. pullorum* are found in eggs laid by hens reacting to the agglutination test suggests the possibility of a certain degree of immunity being transmitted through the egg. The work of Roberts and Card[5] on the inheritance of resistance to bacillary white diarrhea further substantiates such a possibility. Furthermore, the work of Beaudette, Bushnell and Payne[6] suggests the possibility of pre-hatching mortality among infected eggs, thereby reducing the number of infected chicks hatching.

It is impossible to determine the percentage of exposed chicks which were infected in the machine. No doubt, many of the chicks dying from the disease became infected by contact in the brooder. However, it is evident that the disease is readily transmitted from one part of the machine to another.

Jones[7] found that chicks were most susceptible to the disease during the first 24 hours of life. The work of Rettger, Kirkpatrick and Stoneburn[8] also points out that with the increasing age of the chick there is a decrease of susceptibility to bacillary white diarrhea. The fact that the chicks used in this experiment were held in darkened chick-boxes, for 60 hours before being placed under the brooders, thereby probably eliminating infection through the alimentary tract during that time, would indicate that the greatest degree of infection occurred in the incubator.

The symptoms exhibited by infected chicks were typical of bacillary white diarrhea as described by others. The writers observed, however, that in a large percentage of cases lung lesions were present. In some instances the lesions were no larger than a pin-head, while others were of such dimensions as to cover the entire area of the lungs. Pure cultures of *S. pullorum* were isolated from these lesions with little difficulty. The presence of these lesions suggests the possibility of the respiratory tract being the portal of entry for the organism in these experiments.

Summary

1. Bacillary white diarrhea was transmitted to normal chicks from infected eggs hatched from reactor hens in a force-draft incubator in six out of eight hatches.

2. The mortality from *S. pullorum* infection was greatest in the exposed chicks hatched in the same end of the incubator as the infected chicks, and lowest in the exposed chicks hatched in the opposite end. No mortality from bacillary white diarrhea occurred in the control chicks.

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PERSONALS

Dr. R. Fenstermacher (O. S. U. '17), formerly with the Minnesota State Live Stock Sanitary Board, is now located at University Farm, St. Paul, Minn.

Dr. Warner Sidener (Ind. '09), of Milford, Ill., has been appointed Deputy Assistant State Veterinarian and has been assigned to tuberculosis eradication work, with headquarters in Chicago.

Dr. E. L. Stubbs (U. P. '11), formerly Director of the Laboratory of the Pennsylvania Bureau of Animal Industry, now fills the chair of pathology in the Veterinary School, University of Pennsylvania.

Dr. J. E. Shillinger (Geo. Wash. '14), formerly a member of the staff of the Zoological Division, Bureau of Animal Industry, has accepted a position in the Bureau of Biological Survey, U. S. Department of Agriculture.

Dr. R. F. Bourne (K. C. V. C. '05), of Fort Collins, Colo., is now serving as director of the R. O. T. C. band of the Colorado Agricultural College. This band numbers fifty pieces and has the reputation of being one of the best in the Eighth Corps Area. It was formerly directed by Dr. Wm. H. Feldman (Colo. '17), who is now a member of the staff of the Mayo Foundation, at Rochester, Minn. Dr. Bourne has also been commissioned a captain in the Veterinary Corps of the Colorado National Guard, being attached to headquarters of the 89th Infantry Brigade. At the present time, he is assigned to duty as administrative officer for the regimental band of the 157th Infantry, with which organization he was formerly connected for some five years.

THE PENALTY

Nurse: "Yes, Johnny, the doctor brought twins."

Johnny: "Gee, that's what we get for having a specialist."

He: "I hear the weather man resigned."

She: "Yes, the climate didn't agree with him."—*Columbia Jester.*

ON THE ACCURACY OF THE AGGLUTINATION TEST FOR BACTERIUM PULLORUM INFECTION AS SHOWN BY REPEATED TESTS ON THE SAME BIRDS.

By I. E. NEWSOM, FLOYD CROSS AND O. C. UFFORD

Laboratory of Veterinary Pathology, Colorado Agricultural Experiment Station, Fort Collins, Colo.

Since the work of Rettger and his associates (1900), Jones (1910),[1] and Gage (1911), it has been assumed that carrier hens could be picked from a flock by means of the agglutination test, with a high degree of accuracy. In fact, the dependence has been so great that several state laws have been passed on the assumption that carrier hens could be readily detected by this method.

Recently, the work of Beach (B. A.), Halpin and Lampman[2] and J. R. Beach[3] has cast considerable doubt upon the reliability of the test and forced interested workers to review the whole question. The first-named authors presented a table showing the reactions obtained from testing 63 hens from one to ten times in thirteen months. Eliminating four that were tested only once, the results were consistent in 28 of the birds and contradictory in 31.

The latter author found that of fifty positive birds tested monthly during a year's time, only 10 (20 per cent) were consistently positive throughout. Nor did those that failed to react do so consistently. Rather the record was so contradictory that one is led to look upon it as a veritable jumble. Still worse, *Bacterium pullorum* was isolated from the ovaries of two birds that had failed to react for three consecutive times and from one that had been negative for five tests. The result of the first year's work caused J. R. Beach to conclude:

> A positive reaction to the agglutination test may be considered as a highly accurate indication of *Bacterium pullorum* infection. A negative reaction to a test, however, appears to less accurately indicate freedom from *Bacterium pullorum* infection either recently acquired or of long standing.

One of us (Ufford) started a piece of graduate work in November, 1925, by placing 21 reactor and 29 non-reactor fowls in the same house with the intention of carrying on monthly tests

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and recording production, fertility and hatchability of eggs and livability of chicks over a period of two years. During the time of observation 19 other fowls were added to the flock either as culls or as reactors. Owing to loss of records in a fire that occurred January 28, 1927, and to a change of position on the part of the worker, the experiment was never finished. How-

TABLE I—*Repeated agglutination tests on 37 birds with postmortem findings and culture*

NUMBER	11–22–25	11–22–25	1– 2–26	2–27–26	4–30–26	5– 1–26	7–27–26	3– 6–27	7– 9–27	LESIONS*	CULTURE
27	+	+	+	+	+	+	+	+	+	Discolored, misshapen	+
29	+	+	+	+	+	+	+	+	+	Active, cystic	+
32	—	—	—	—	—	—	—	—	—	Misshapen, discolored	—
35	+	+	+	+	+	+	+	+	+	Resting, normal, one cyst	+
40	—	—	—	—	—	—	—	—	—	Resting, one enlarged and firm	—
41	—	—	—	—	—	—	—	—	—	Discolored	—
52	+	+	+	+	+	+	+	+	+	Discolored and misshapen. Bird thin. Liver shows gray spots	+
62	—	—	—	—	—	—	—	—	—	Ovary atrophied	—
65	—	—	—	—	—	—	—	+	+	Cystic, discolored, misshapen	—
71	—	—	—	+	+	+	+	—	—	Cystic, discolored, misshapen	+
97	—		—	—	—	—	—	—	—	No lesions. Male.	—
99	—		—	—	—	—	—	—	—	No lesions. Male.	—
100	—		—	+	+	+	+	+	+	No lesions. Male.	—
112	—	—	—	—	—	—	—	—	+	Ovary resting, large cyst in abdomen	—
156	—	—	+	+	+	+	+	—	+	Resting, four cystic ova	+
157	+	+	+	+	+	+	+	+	—	Ovary misshapen, cystic. Liver large, shows gray spots	+
160	+	+	+	+	+	+	+	+	+	Active, cystic	+
162					+	+	+	+	+	Ovary normal	—
163	+	+	+	+	+	+	+	+	+	Cystic, discolored, misshapen	+
170	+	+	+	+	+	+	+	—	+	Normal, one ovum discolored	+
179	+	+	+	+	+	+	+	+	+	Ovary cystic	+
192	+	+	+	+	+	+	+	+	+	Enormously enlarged, cystic and solid	+
194	+	+	+	+	+	+	+	+	+	Markedly discolored and misshapen	+
195					+		+	—	—	Active, two ova cystic	+
196					+	+	+	+	+	Resting, one cystic	+
199	—	—	—	—	—	—	—	—	—	Normal	—
202	—	—	—	+	+	+	—	+	+	One misshapen, several cystic	+
209	—	—	+	—	+	+	—	+	+	Slightly misshapen and discolored	—
210					+	+	+		+	Resting, two ova cystic	+
213					+	+	—	—	—	Discolored	—
224	—	—	—	—	—	—	—	—	—	Discolored and misshapen	—
229	—	—	+	+	+		—	—	—	Normal	—
235	+	+	+	+	+	+	+	+	+	Discolored, several cystic	—
239	—	—	—	+	+	+	+	+	+	Small, discolored, misshapen	—
242	—	—	—	—	—	—	—	+	—	Resting, normal	—
244	+	+	+	+	+	+	+	+	+	Cystic, misshapen, discolored	+
250	—	—	—	—	—	—	—	—	—	Active, one ovum discolored and firm. Liver shows yellowish spots	—

*The statement refers to the ovary unless otherwise stated.

ever, to salvage something from the work, two further tests were run by one of us (Cross) and the remaining birds were slaughtered and cultured on July 9, 1927, by the senior authors.

Table I shows only the birds that remained on the above date, as the cultural and postmortem records were incomplete on many of them that had died previously.

This table gives a record of from four to nine consecutive tests on 37 birds with postmortem and cultural findings. The first two tests are given under the same date, one being done by Ufford and the other, a check test, by Miss Ruth Harrison, technician in our laboratory, who had become highly proficient in the work. The next five were Ufford's and the last two, as previously stated, were by Cross. Briefly the table can be summarized as follows:

SUMMARY OF TABLE I

Birds (whole number)	37
Consistently positive:	
Positive for 9 tests	11
" " 6 "	2
" " 5 "	2
" " 4 "	1
" " 2 "	1
" " 1 "	1
Total positive	18
Consistently negative:	
Negative for 9 tests	7
" " 8 "	2
Total negative	9
Contradictory	10
Cultures:	
From consistently positive	12
" " negative	0
" contradictory	6
Total cultures	18

It seems to us that the bright spot in this summary is that no positive cultures were obtained from consistently negative birds.

In digesting this work it occurred to us that we had done some previous testing on these same birds and on going back into our older books, which had fortunately been preserved from the fire, we found a general flock-test, made on June 28, 1924, and a series of eleven tests, made between April 20 and July 10, 1925. These weekly tests were all run by Cross and checked by Miss Harrison, comparison being made only after independent readings. Each of them really represents two separate tests. Adding these tests to the other series, we have 21 tests on several of the birds, covering a period of three years. Because of the doubt recently thrown upon the test, it seemed best to offer this data for publication, since it not only gives a large number of

consecutive tests on the same birds but it introduces the added factor of four different workers. These data are presented in table II.

How the Tests Were Conducted

Our antigen was usually made from four strains of *Bacterium pullorum* by growing each separately on the surface of beef infusion agar and washing off at the end of 48 hours with physio-

TABLE II—*Repeated agglutination tests on the same birds*

Number	6-28-24	4-20-25	4-21-25	4-27-25	5- 5-25	5-13-25	5-22-25	5-30-25	6-19-25	6-26-25	7- 3-25	7-10-25	11-22-25	11-22-25	1- 2-26	2-27-26	4-30-26	5- 1-26	7-27-26	3- 6-27	7- 9-27	Culture
	Consistently Negative																					
40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
41	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—		—	—	—	•	—	—	—	—	—	—	—	—	—	—
62		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
224		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
139	—	—	—	—	—	—	—	—	—	—	—	—										
42	—	—	—	—	—																	
199													—	—	—	—	—	—	—	—	—	—
250													—	—	—	—	—	—	—	—	—	—
97														—	—	—	—	—	—	—	—	—
99														—	—	—	—	—	—	—	—	—
158													—	—	—	—	—	—				
171																—	—	—	—	—		
	Consistently Positive																					
29	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
35	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
52	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
43		+	+	+	+	+	+	+	+	+	#	+	+	+	+	+	+	+	+	+		
217	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			
235	—	—	#	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	—
244	—	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
27	—	+	+		+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
222	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
206	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+				
44	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+							
231	—	+	+			+		+	+	+	+	+	+	+	+							
74		+	+	+	+	+	+	+	+													
238	—	+	+	+	+	+	+	+														
245	+	+	+	+	+	+	+															
66		+	+	+	+	+		+														
160													+	+	+	+	+	+	+	+	+	+
179													+	+	+	+	+	+	+	+	+	+
192													+	+	+	+	+	+	+	+	+	+
194													+	+	+	+	+	+	+	+	+	+
163													+	+	+	+	+	+	+	+	+	+
100														—	—	+	+	+	+	+	+	—
162																	+	+	+	+	+	—
196																	+	+	+	+	+	+
210																	+	+	+		+	+

TABLE II—*Continued*

CONTRADICTORY

65	+	+	+	+	+	—	—	—	—	—	—	—	—	—	—	—	—	+	+	—
112	—	+	+	+	+	+	—	—	—	—	—	—	—	—	—	—	—	—	+	—
239	+	+	+	+	+	+	—	—	+	+	+	—	—	—	+	+	+	+	+	—
242	+	+	+	+	+	+	—	—	—	—	—	—	—	—	—	—	—	+	—	—
202	+	+	—	+		—	—	—	—	—	—	—	—	—	+	+	+	—	+	+
229	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+		—	—	—
71		+	+	+		—	—	—	—	—	—	—	—	—	+	+	+	+	—	—
237	+	±	—	±	—	—	—	—	—	—	—	—	+	+	—	—	—	—		
209					+	+	+	+	—	+	±	—	—	—	+	—	+	+	—	+	+	—
225	+	±	—	+	+	+	—	+	—	—	—		—	—	±	+	+	+			
232		—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—			
26	+	+	+	+	+	+	+	+	—	+	+	+	—	—	—	+					
208	—	—	—	±	+	+	+	+	—	+	±	—	—	—	—						
214					+	—	—	—	—	—	—	—	—	—	—	—	—	—			
57	—	±	—	±	+	+	—	+	±	+	±	—									
216	+	+	+	+	+	+	+		—	—	—	—									
156													—	—	+	+	+	+	—	+	+
157													+	+	+	+	+	+	+	—	+
170													+	+	+	+	+	+	—	+	+
213																	+	+	—	—	—
195																	+		+	—	—	+

logical salt solution. The density was approximately that of tube 1 of the MacFarland scale, although this can only be guessed at for the earlier tests. It was preserved with .5 per cent phenol. A one-tube test was run, using 1 cc of antigen and an amount of serum that would make the dilution approximately 1-60. The tubes were placed in the incubator over night and then left at room temperature until the end of the 24-hour period,

SUMMARY OF TABLE II

Birds (whole number)		59
Consistently positive		25
Positive for 21 tests	3	
" " 19 "	4	
" " 18 "	2	
" " 15 "	1	
" " 11 "	1	
" " 9 "	5	
" " 8 "	1	
" " 7 "	2	
" " 6 "	2	
" " 5 "	3	
" " 2 "	1	
Consistently negative		13
Negative for 21 tests	2	
" " 20 "	2	
" " 19 "	1	
" " 12 "	1	
" " 9 "	2	
" " 8 "	2	
" " 6 "	1	
" " 5 "	2	
Contradictory		21

when final reading was made. The ± sign usually means an incomplete reaction, but in the earlier work we were having some trouble with cloudy reactions and it may mean only doubt due to that condition. In the summary we have called all ± positives.

Discussion of Table II

It will be seen from the summary that of the 59 birds included in the table 25 were consistently positive, 13 consistently negative and 21 were contradictory. It may be well to state that consistently positive does not mean that they were always positive, but having become so they continued to react positively throughout the rest of the series. All of the consistently positives that went through to the end of the experiment gave a positive culture except three. One of these was a male (100) in which no lesions could be found, culture being made from the testicle, and the other two (235 and 162) probably carried the organism but we failed to find it. Seven of these birds were negative on the first test and later became positive, indicating a spread of infection between mature fowls.

One hardly knows what to say of the contradictory birds. Those that showed a preponderance of positives generally gave a positive culture, and those with a majority of negatives, a negative culture. Howevér, this was not always true. Bird 239, with only 6 negatives, gave a negative culture, and birds 202 and 71 gave positive cultures with only 8 and 7 positive tests respectively.

The interesting point is that several birds, like 65, gave several positives, then a number of negatives, and again became positive toward the end of the series. This would seem to throw some doubt on the question of permanent recovery. The most disconcerting part of the record is well illustrated by birds 71, 156 and 195, where positive birds became negative and were still carrying the organism as shown by the culture. It may be that the titre of these birds merely fell below our 1-60 dilution and that they would have reacted at 1-25; but the work of J. R. Beach indicates that even the lower dilution did not eliminate these inconsistencies.

Finally, it ought to be said that the single positive in bird 232 probably indicates an error on our part. When one follows these tests through from the drawing of the blood to the final report, one marvels that there are not more errors in copying and recording. We rarely get a lot of blood-samples from

owners or even veterinarians in which there are not duplicate numbers.

Taking it all in all there is ground for satisfaction that three positive and two negative hens could be tested 21 times in three years, four different workers taking part, and still have all of the tests agree.

We are inclined to agree with J. R. Beach that a positive reaction to the agglutination test indicates *Bacterium pullorum* infection, with a high degree of probability. On the other hand, a negative test, at least at a 1-60 dilution, may not mean freedom from disease. The suggestion is left that judging from our experience in eradicating abortion disease from cattle, monthly tests would be far more efficient in a clean-up of white diarrhea than the annual tests as now conducted.

Conclusions

Allowing for errors of reading, marking and copying there are still inconsistencies in repeated agglutination tests on the same hens.

These inconsistencies appear to be resident in the agglutinin content of the blood.

Some hens carrying *Bacterium pullorum* will fail to react at a dilution of 1-60.

These findings should not, however, in the light of our present knowledge, lead to the abandonment of the test as a means of eradication, but to a frank recognition of its deficiencies.

They suggest the application of the test at more frequent intervals, in order to get all of the carrier birds.

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NEWS ITEMS

Abbott Laboratories, of North Chicago, Illinois, have recently purchased the entire pharmaceutical business and good will of John T. Milliken & Company, of St. Louis, Missouri.

The National Veterinary Association of Cuba donated a silver cup as a premium for the best native, gaited, saddle stallion that was exhibited at a fair held recently near Havana.

THE ABSORPTION RATE OF THE RESERVE YOLK IN BABY CHICKS*

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In necropsy work on baby chicks, the laboratory diagnostician, the clinician and the general practitioner have had occasion to observe the variable amounts of unabsorbed yolk which may be encountered. That the amount of yolk found bears some relationship to the health of the chick or to the pathological conditions which it may present has for a long time been surmised. Data regarding the normal rate of disappearance of the reserve yolk or regarding the reasons for variability in the rate of its absorption have been lacking, however. This paper reports the findings encountered in a study designed to obtain some information on the points under discussion.

The weight of the yolk of the hen's egg varies with the age of the bird, the breed, idiosyncrasy of the individual, and probably a number of other factors. The yolk of eggs from White Leghorn adult hens, however, weighs about 20 grams. Early in the embryological development of the chick, a vascular tissue grows out from the fertilized germinal disk which lies at one pole of the yolk mass; this tissue surrounds the yolk and is called the yolk sac or vitelline membrane. Other outgrowths, of which the allantois and the chorion are the principal structures, develop into such relationship with the white of the egg so that the absorption of this material is facilitated.[1] The yolk and the white albumin of the egg are attacked by the embryonal enzymes and are reduced to amino-acids; the amino-acids are diffusible, pass into the capillaries of the vessels contained in the tissues of the yolk sac, of the allantois and of the chorion, and are then transported to the embryo proper, where they are utilized in the processes of growth and development.

About three days before the embryo is ready to be hatched, a rapid growth and infolding of the tissues at the umbilicus cause that portion of the yolk which has as yet not been absorbed to be enclosed within the abdominal cavity. This is purely a mechanical inclusion and not, as one commonly hears it stated,

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"absorption" of the yolk. For absorption of the yolk involves the steps of digestion by the embryonal enzymes and the diffusion of the products of digestion, chiefly amino-acids, into the vascular system of the embryo or its nutritive appendages.

After the yolk has been enclosed within the body-cavity, its utilization goes on as before until, under normal conditions, it has been entirely absorbed. Under pathologic conditions, however, considerable masses of the same may still be encountered for weeks or months after the chick has been hatched. At necropsy or slaughter, dessicated, cystic or calcareous masses, of varying shape, size and color, are found attached to the jejunum where yolk sac and alimentary canal normally are attached to each other. When chicks from a few days to two or three weeks of age are suffering from a non-specific bowel disturbance characterized mainly by diarrhea, necropsy frequently reveals yolk masses

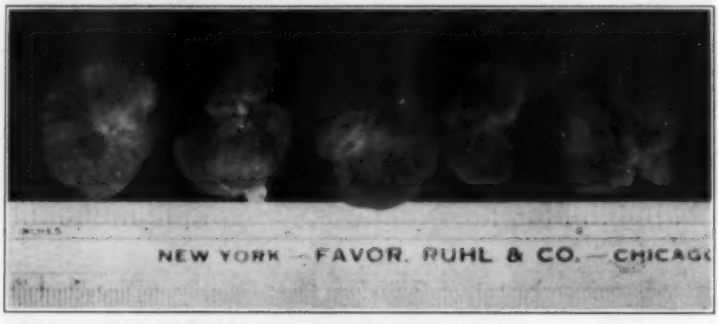

FIG. 1. Residual yolk masses in White Leghorn baby chicks at 72 hours. Chicks 1 to 5 (left to right). Scale 3/4.

similar in appearance to hard-boiled egg. The cystic or calcareous findings are encountered in older birds which may also at times show larger or smaller remnants of dessicated yolk with pathologic clinical symptoms being present or absent.

Fundamentally the miscarriage of the normal process of the absorption of yolk may safely be predicated to rest upon: (1) a change in the yolk, which renders it less readily digestible by the embryonal enzymes, a lack of enzymatic activity or of the enzymes themselves; or (2) a mal-development of the yolk sac at some stage by which the vascular system of that structure is reduced or becomes less capable of taking up by diffusion the digested yolk or because of which the tissues of the yolk sac acquire a secretory function and thus lead to cyst formation. It may safely be assumed that masses of undigested or indigest-

ible yolk act as foreign bodies. They become irritants and produce local pathological changes; if infected, they may also be the source of a toxemia or a sapremia, as the case may be, and lead to general disturbances of health.

It has been assumed in some quarters that high incubator temperature or excessive aridity of the atmosphere in the incubator, with consequent cooking or dessication of the yolk, is responsible for delay in the absorption of the same; these factors may in fact influence its digestibility and may exert their effect even though they act through but a fraction of the incubation period. Again, the development of bacteria of certain types may produce changes in the yolk or in the tissues of the yolk sac so that digestion and absorption of the yolk is delayed; hyperplasia

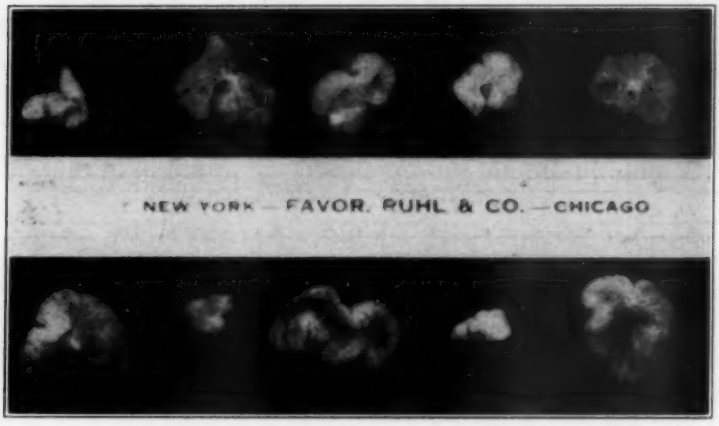

FIG. 2. Residual yolk masses in White Leghorn baby chicks at 5 days. Liberal feeding above (chicks 6 to 10, left to right). Restricted feeding below (chicks 36 to 40, left to right) Scale 3/4.

or atrophy of the vitelline membrane can not be neglected as contributing causes and may result from abnormal conditions of bacterial etiology. Moreover, the vigor of the chick itself undoubtedly is reflected in the abundance, the activity and the nature of the enzyme which it elaborates. In cases of constitutional depression, secretion of alimentary enzymes is inhibited to a greater or less degree. This being true, there is presented the probability that in such cases catalases capable of attacking the reserve yolk may also be wanting in chicks of low vitality.

Finally, a relationship has been assumed to exist as between the time one should begin to feed baby chicks and the degree to which the reserve yolk has been utilized.[2,3,4,5] It is commonly

recommended not to feed baby chicks until they are 48, 72, or 96 hours old, the specified time depending upon the source of the recommendation, but the reason given being the same—to permit time for the absorption of the residual yolk. It is of interest, therefore, to know whether feeding practices have in fact an influence on the rate of absorption of material. Data on all of the points and answers to all of the questions raised in the foregoing discussion are not supplied here. It was felt desirable, however, in view of the scarcity of reliable information on these matters which is available, to consider the matter in some detail and to present the data now on hand, hoping to amplify them later.

FIG. 3. Residual yolk masses in White Leghorn baby chicks at 7 days. Liberal feeding above (chicks 11 to 15, right to left). Restricted feeding below (chicks 41 to 45, right to left.) Scale 3/4.

EXPERIMENTAL PROCEDURE

Seventy-five incubator-hatched, White Leghorn baby chicks were obtained. These chicks came from a flock which had been tested for carriers of *S. pullorum* by the agglutination method and no reactors were found. The chicks were delivered to the laboratory when 72 hours old and had not been fed. Five were immediately chosen at random and were weighed and necropsied. The unabsorbed masses of yolk were removed and weighed, these weights as well as the gross weights of the chicks being recorded.

The remainder of the chicks were then divided into three groups. Before one of these there was kept at all times a supply of buttermilk and in addition there was fed to them four times a day as

much rolled oats as they would consume. Data on these chicks are presented in table I. To another group (table II) there was also fed buttermilk in unlimited amount, but they received only one feeding of rolled oats a day, which was equal in quantity to a single feeding from the former group. In controlling the

TABLE I.—*Weight of chicks and weight of yolk residues found; feed not restricted*

CHICK	AGE (DAYS)	GROSS WT. (GM.)	WT. OF YOLK (GM.)	LIMITS OF VARIATION OBSERVED
1	3	34.2	2.64	2.03
2	3	30.2	2.16	
3	3	34.7	4.05	to
4	3	30.3	2.03	
5	3	40.3	3.61	4.05
6	5	36.0	0.43	0.43
7	5	39.2	1.32	
8	5	44.7	1.17	to
9	5	38.5	0.65	
10	5	37.7	0.97	1.32
11	7	41.0	0.03	0.03
12	7	36.9	1.18	
13	7	38.2	0.82	to
14	7	38.0	2.95*	
15	7	44.5	0.44	2.95
16	9	44.5	4.23*	
17	9	52.0	0.005	
18	9	49.1	0.006	0.004
19	9	47.0	4.80*	
20	9	47.6	0.004	to
21	9	42.3	0.027	
22	9	48.9	0.051	4.80
23	9	50.2	0.044	
24	9	50.4	0.010	
25	9	41.8	0.546*	
26	14	67.0	0.004	
27	14	72.2	0.001	
28	14	69.4	0.002	0.001
29	14	83.2	0.001	
30	14	74.5	0.002	to
31	14	84.0	0.001	
32	14	95.9	0.080	0.080
33	14	92.0	0.001	
34	14	87.4	0.003	
35	14	85.2	0.001	

*Yolk masses cultured and examined bacteriologically; no bacteria found.

quantity of feed offered to the second group, it was endeavored throughout to maintain the amount at one-fourth of the daily ration of the first group. Since the amount of rolled oats consumed by the chicks which received a full ration increased as

they became older and since the number of chicks in both groups was reduced from time to time by making use of them for necropsies, the actual amounts fed varied from time to time. The point of interest here, however, concerns the relative, rather than the absolute, amount of feed consumed and for the sake of brevity the weights of feeds consumed are not presented. The chicks of these two groups were held in the same brooder, which was maintained at 90° F., a partition keeping the two groups separate from each other. The third or control lot was placed on a grass plot with a nurse hen; they were fed in a manner comparable to

TABLE II.—*Weight of chicks and weight of yolk residues found; feed restricted*

CHICK	AGE (DAYS)	GROSS WT. (GM.)	WT. OF YOLK (GM.)	LIMITS OF VARIATION OBSERVED
1	3	34.2	2.64	2.03
2	3	30.2	2.16	
3	3	34.7	4.05	to
4	3	30.3	2.03	
5	3	40.3	3.61	4.05
36	5	37.2	2.07	0.26
37	5	32.7	0.26	
38	5	38.5	2.74	to
39	5	35.7	0.31	
40	5	33.9	2.28	2.28
41	7	32.9	0.39	0.23
42	7	36.7	2.95*	
43	7	26.7	0.61	to
44	7	37.0	0.23	
45	7	30.5	0.58	2.95
46	9	31.4	0.09	0.07
47	9	27.7	0.16	
48	9	28.7	0.07	to
49	9	38.2	0.75*	
50	9	33.9	0.16	0.75

*Yolk masses cultured and examined microscopically; no bacteria found.

the first group. They served as a control on the health and vigor of the chicks utilized. In this group there occurred no losses from any cause and the chicks made excellent growth and gains up to the end of the period of observation, which was eight weeks.

On the fifth seventh, and ninth days after hatching, a number of chicks were removed from the first two groups. After obtaining their gross weights they were killed and necropsied, the weight of the residual yolk mass being determined as before. Observations for residual amounts of reserve yolk at fourteen days were made on ten chicks from the control lot, the usual data again

being obtained and recorded (see table 1). Photographs of the residual yolk masses were made in all instances, several of which are reproduced herewith (see figs. 1 to 3).

On the fifth day after hatching, the chicks on restricted feed showed a tendency toward cannibalism, manifested by pecking at each other's toes and heads. On this account it became necessary to darken their compartment of the brooder except at feeding time; this controlled that difficulty.

The residual yolk masses were in all cases examined and were found to be of a greenish-yellow color, more or less lobulated and the contents soft and yielding. On incising the yolk masses the contents of those weighing 0.20 gm. or more was found to be gelatinous; the yolk masses of lesser weight than that just indicated tended to be butyrous. On the seventh and ninth days, a number of yolk masses were encountered which were much larger than the mean for that time. These were cultured for bacterial growth, and microscopic preparations also were made from them. No evidence of the presence of bacteria was found in any case.

The experimental data are presented in two tables and three figures. In the tables an average weight of yolk mass at any given period is not indicated, since the wide variation which may be observed would make a mean weight of little value. The limits of variation observed at the various periods, however, are indicated. The most striking differences, as between individuals, may be seen by reference to table I, where at nine days chicks 16 and 19 presented yolk masses weighing 4.23 and 4.80 gm. respectively, while chicks 17 and 18 presented such masses of the respective weights of 0.005 and 0.006 gm.

Necropsy examination, bacteriological culture and gross and microscopic examinations of the contents of the yolk sac failed, however, to reveal any cause for the slow rate of digestion and absorption of the larger yolk masses. Moreover, when the gross weights of chicks are taken into consideration in comparing the weights of residual yolk masses, there is no indication in this group of chicks that chicks making more rapid gains used up their yolk more rapidly or that slow absorption was accompanied by retarded gains. Compare chicks 19 and 20 (table I), the former weighing 47.0 and the latter 47.6 gm., while the residual yolk masses weighed 4.80 and 0.004 gm. respectively. Here the unabsorbed yolk appears to have done no damage to the chick. Again comparing chicks 16 and 21, it appears that the chick making the more rapid gain and thus giving evidence of greater

constitutional vigor does not neccessarily dispose of its reserve yolk mass more rapidly than the more unfavorably constituted individual.

As late as the ninth day, there was no evidence that the quantity of feed consumed influenced the rapidity of the absorption of yolk. The data obtained on the weights of yolk masses of chicks on restricted rations come within the limits of variation found among those fed more liberally. This points toward the conclusion that governing the time to commence feeding baby chicks according to the progress which has been made in utilizing reserve yolk is fallacious and that the location of the cause for retarded absorption may be found elsewhere.

From the data it may be observed that two to four grams of yolk may commonly be found at the third and fifth days, though at the latter period the yolk may be considerably reduced in certain individuals. It also shows that, by the seventh and ninth days, in most individuals the yolk mass has been reduced to a fraction of a gram and by the fourteenth day one may expect to find but small remnants of this reserve food.

A larger number of individuals would undoubtedly have revealed still greater limits of variability. It would also indicate more clearly the relative frequency with which the various rates of digestion and absorption of yolk masses may be encountered. The available figures, however, are illuminating and show that great variability may be anticipated even in an apparently healthy and properly hatched bunch of chicks.

Summary and Conclusions

White Leghorn chicks from a controlled source and from a given hatch were divided into three groups, to two of which was fed a liberal and to the third a restricted ration. At intervals individuals were chosen at random from each group and necropsied and the amount of residual yolk was determined.

Wide differences were observed in the individual rates of utilization of the reserve yolk, unaccompanied by observed pathological changes or bacterial interference. The level of intake of feed was not found to influence the rate of disappearance of yolk. Chicks making the better gains did not necessarily digest and absorb their reserve yolk more rapidly; the converse also was true. Up to the fifth day, considerable masses of unabsorbed yolk may usually be found and an infectious or other pathological

state is not predicated even on the presence of yolk masses weighing up to four grams on the seventh to ninth days.

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WONDER WHAT KIND OF HUMAN RACE WE COULD DEVELOP

IF THE SCIENTIFIC CARE WE DEVOTE TO RAISING LIVESTOCK—

WERE EXTENDED TO COVER THE CARE AND FEEDING OF OUR CHILDREN.

Cartoon by "Ding" (J. N. Darling) in Des Moines (Iowa) Register.

SOME EXPERIMENTS IN DISINFECTING INCUBATORS WITH FORMALDEHYDE

By CHAS. J. COON,* *Blacksburg, Va.*

Department of Zoology and Animal Pathology
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Hinshaw, Upp and Moore[1] have pointed out that the infection of bacillary white diarrhea could be disseminated by artificially infected chick-down, placed in an incubator of the type popularly known as forced-draft.

Weaver[2] reported experiments in which he used naturally infected chicks as a source of infection in a forced-draft incubator and found the spread of infection to normal healthy chicks during incubation.

Gwatkin,[3] reporting a series of experiments on disinfection of incubators, found that an incubator was satisfactorily disinfected with formaldehyde on one occasion six times, and on another eight times, during hatching, without doing any apparent harm to the hatch. The incubator used in experiments by Gwatkin was of the still-air type.

During October and November, 1927, the writer conducted a series of tests to determine if the experiments outlined by Gwatkin could be applied to the large forced-draft incubators used commercially. During these tests the writer was assisted by J. H. Hackley, a commercial hatcher, to whom he is indebted for valuable assistance in developing technic and methods that can be used by the layman. The writer is also indebted to him for the use of his incubator, his equipment and eggs, which made the tests possible.

In Gwatkin's experiments he used 30 cc of formalin and 10 grams of potassium permanganate to generate the formaldehyde in an incubator having an approximate capacity of 15 cubic feet. He found it necessary to seal the doors and close all openings for one hour after gas was applied before he obtained satisfactory results. Our tests, therefore, were conducted to determine whether satisfactory results could be secured with formaldehyde in a large forced-draft incubator, the quantity necessary, the period of exposure, and to determine whether or not it is necessary to seal the incubator during the disinfection period.

In conducting all experiments, pieces of egg-shell were properly sterilized and placed in Petri dishes. When cooled down to room

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*Resigned.

temperature, they were dipped in a physiological saline suspension of *Salmonella pullorum* and allowed to dry. Control pieces were planted at this time in sterile broth. In each experiment four Petri dishes containing egg-shells were exposed in different parts of the machine. After stated periods of exposure, the shells were planted in sterile broth and incubated. The formalin was introduced into the incubator by means of a pressure spray tank, connected to two discharge nozzles within the machine and directly under the fans. Twenty feet of rubber hose connecting tank and nozzles made it possible for the operator to remain outside.

On October 22, 1927, six trays, totalling 788 eggs, were set at 6:00 p. m. All intake and exhaust ports were sealed with paraffin paper and paraffin wax. At 7:10 p. m., 1700 cc of formalin was introduced as described and followed immediately by 1000 cc of water. (Gwatkin used 2 cc of formalin to each cubic foot capacity, making 1700 cc necessary for like proportion.) At 8:10 p. m., the ports were opened. One Petri dish was removed at 8:17 p. m., one at 8:18 p. m., and the remaining two at 8:40 p. m. The exposed pieces of egg-shell were planted in tubes of broth and incubated. Normal growth occurred from the control but none from the exposed shell.

After allowing the machine to clear, at 9:35 p. m. on the same date, with all ports open and machine as of normal operating conditions, the second experiment was as follows: 1700 cc of formalin was introduced, as previously described, except not followed by water. Thirty minutes later, 280 cc of formalin was introduced in the same manner, followed fifteen minutes later by another like amount. At 11:00 p. m., the door of the machine was opened and the Petri dishes removed. The exposed pieces of shell were planted and incubated as in the first experiment. No growth occurred from the exposed shell, while normal growth occurred in the control.

On October 26, at 6:00 p. m., a second setting of 162 eggs was put in the machine. At 9:30 p. m., the same day, the machine was disinfected as follows: With the ports open and the machine as normally operated, 1700 cc of formalin was introduced in the regular manner. After a lapse of thirty minutes, 280 cc of formalin followed every fifteen minutes until 1120 cc additional had been put in. At 11:10 p. m., the Petri dishes were removed, the shell planted in sterile broth and incubated. In this experiment,

as before, the exposed shell was sterile while the control gave normal growth.

On October 30, 448 eggs were added to the machine. November 1, the incubator was disinfected while in normal operating condition with 500 cc of formalin, with 1500 cc of cold water added. Four Petri dishes containing shells were exposed as before for one and one-half hours. After removal the shells were planted in broth and incubated. The control showed normal growth, while in the exposed shell no *Salmonella pullorum* developed, but a spore growth showed after four days.

November 7, the incubator in normal working condition was disinfected with 250 cc of formalin diluted with 1000 cc of boiling water, egg-shells were exposed for one and one-half hours and treated as before. Normal growth occurred in the control and retarded growth, apparently *Salmonella pullorum*, occurred on the exposed shells.

November 12, the incubator was again disinfected, using 500 cc of formalin and 1000 cc of boiling water. For fifteen minutes after formalin was introduced, the intake port was partially closed to prevent rapid change of air, otherwise machine was in normal working condition. Shells were exposed and treated as before. Normal growth occurred in the control, but no growth of *Salmonella pullorum* in the exposed shells. After the third day, however, a spore growth showed in one of the tubes.

In these experiments, facilities have not permitted the plating of growths but to all appearances they are as represented. The eggs used in these experiments were normal eggs of this season. The first setting was ten days older than would normally be set during the spring season. The incubator was not watched closely and the temperature on three occasions dropped to 90° F. during the night.

No control eggs were placed in other incubators so one can only estimate the damage to the eggs by the disinfecting. The first setting of 788 eggs resulted in 176 infertiles, 282 dead germs and 330 chicks. The second setting of 162 eggs gave 24 infertiles, 37 dead germs and 101 chicks. The third setting of 448 eggs had 74 infertiles, 93 dead germs and 281 chicks.

The chicks from the first hatch were divided into three lots of 100, 100 and 134. One lot was shipped over one thousand miles, one shipped one hundred miles and the other supplied to local customers. At two weeks old the mortality in the first lot was 11 per cent, in the second 3 per cent but no record was kept of

the third lot. At the present writing, chicks from the second hatch are just two weeks old. The mortality so far in the second hatch is 12 per cent and in the third hatch 1 per cent. The chicks appear normal in every way.

From this it will be seen that after five exposures of one and one-half hours, each to formaldehyde of sufficient intensity to sterilize the exposed shell and one of less concentration, a very fair percentage of fertile eggs hatched. Since three of these exposures were three times as severe as later proved necessary, and since one of the three was with the incubator sealed, it would appear that repeated disinfections of the incubator, using 500 cc of formalin to 850 cubic feet capacity, would have no material effect on the hatch. So far as the writer knows, these experiments are the first attempted in disinfecting the large commercial incubators and, as such, must be recognized as elementary.

SUMMARY

An incubator of the forced-draft type, ten feet wide, thirteen feet long and eight feet high, outside dimensions, containing eggs, was satisfactorily disinfected with formaldehyde five times during hatching without apparent harm to the hatch. Five hundred cc of formalin sprayed into the machine in normal working condition gave satisafctory results when the machine was not disturbed for one and one-half hours after formalin was introduced. Disinfection was checked by exposing pieces of infected shell in the incubator. It was not found necessary to seal the doors or intake and exhaust openings to prevent the escape of gas.

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BUREAU TRANSFERS

Dr. Zeno C. Boyd (K. C. V. C. '07), from Little Rock, Ark., to Baton Rouge, La., on tick eradication.

Dr. Benjamin H. Sisk, from Chicago, Ill., to Louisville, Ky., on meat inspection.

Dr. Truman W. Cole (Chi. '15), from Fort Worth, Texas, to Jacksonville, Fla., in charge of tick eradication.

Dr. J. Bryan Hill (Ont. '96), from Bristol, Va., to Augusta, Ga., on meat inspection.

Dr. Arthur R. Smith (U. P. '08), from Omaha, Nebr., to Wheeling, W. Va., in charge of meat inspection.

Dr. Ralph F. Vermilya (Chi. '06), from Wheeling, W. Va., to Detroit, Mich., in charge of meat inspection.

Dr. Edgar M. Clark (St. Jos. '15), from Chicago, Ill., to Omaha, Nebr.

AVIAN TUBERCULOSIS*

By E. L. STUBBS, *Philadelphia, Pa.*

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Tuberculosis dates back to the time of long ago when people first became civilized and began living in compact social groups. Likewise avian tuberculosis dates back to the time when fowls were first domesticated and kept in groups.

Nearly all the infectious diseases have a more or less natural or limited zoological distribution, being encountered in one order or one division. We have typhoid fever peculiar to man, hog cholera peculiar to hogs, and rinderpest peculiar to catle. A second group, as anthrax and hemorrhagic septicemia, is less specific and may be found affecting several species. The disease tuberculosis is important zoologically, economically, and hygienically, because it seems that all vertebrates are subject to it. Moreover, its mainfestations are sufficiently similar to support the idea that there must have been a common ancestor of the cause of this disease, which we now designate separately, according to its immediate source, as human, bovine, and avian.

The great interest which is being given the subject of tuberculosis on all sides at the present time makes the subject of avian tuberculosis one of very great importance, not only to those interested in poultry but to all those interested in tuberculosis eradication.

Those who first studied tuberculosis found that it was not only a disease of mammals, but that birds also were affected. It has been reported in practically all kinds of birds and in all countries where fowls are raised. It is most commonly found in chickens and in turkeys. Little is known of it in wild birds, but in wild birds kept in captivity it is very often seen. Avian tuberculosis was first described and the organism demonstrated by Pernot, in Oregon, about 1900. Since that time it has been found in most localities where fowls are raised. The general biological characteristics are very much the same as the mammalian type. It is generally described as being somewhat shorter and as staining more evenly than the common mammalian types. Culturally it grows better than mammalian types. It is more easily isolated on artificial culture media and has the ability

*Presented at the Conference of Veterinarians, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, Pa., January 4-5, 1928.

of growing not only on the surface but also beneath the surface of fluid culture media.

When tuberculosis is found in a fowl, it has been introduced into that fowl from some other fowl, either directly or indirectly. Such introduction may follow the addition of new fowls to the flock providing a source of infection. Trimmings and offal from infected carcasses may find their way into garbage, which may be fed to chickens and produce the disease. Rats and mice have been incriminated in transmitting this disease. Some investigators have had difficulty in infecting artificially rats and mice with the avian type. However, it has been shown that rats and mice may transmit the infection when the only means of communication between tuberculous fowls and known free fowls are rats and mice. It would seem from this that the infection is carried mechanically. Sparrows and pigeons are known to be susceptible and, from their habits of association with farmyard fowls, must be considered as a source of danger in the spread of this disease.

Alimentary Tract Is Portal of Entry

It is believed that the intestinal tract is the most common means of exit of the tubercle bacillus in avian tuberculosis. The intestinal lesions usually contain large numbers of tubercle bacilli. The feces from tuberculous fowls often contain large numbers of bacilli. Experimental and clinical evidence strongly indicates that the organisms from the above sources contaminate the food and water of fowls and gain entrance by way of the alimentary tract. Thus the disease is an alimentary infection producing abdominal tuberculosis. So it seems that the droppings from the tuberculous fowls are the greatest source of danger for other fowls. The virulence of the organisms, their number and the constancy of their introduction are also factors in the spread of this disease.

The characteristic lesion is the tubercle. This tubercle degenerates from the center outwards, with necrosis. Very rarely is liquid pus formation found, and calcareous material, as is often the case in cattle, is not found.

Three types of nodules have been described. First, the youngest nodules, in which caseation has not yet begun and which show as small white nodules, in sharp contrast with the surrounding tissue. Second, the older tubercles, in which there is considerable caseation and which appear as yellowish areas and in less con-

trast with the surrounding tissue. Third, the oldest tubercles which are cheesy masses. The older tubercles may be formed by several nodules joining together and becoming confluent, to form conglomerate tuberculosis. Such nodules may be represented by an indefinite cheese mass, or may show concentric stratification. Avian tuberculosis being essentially an abdominal disease, the lesions are most often found in the abdominal cavity. Tubercle bacilli introduced by the alimentary tract find portals of entry in the intestinal mucosa, where they may localize to form an ulcer or perhaps more often to form a nodule in the intestinal wall. Even more frequently than this, the bacilli appear to find their way into the blood-stream and are carried to the liver, because the nodules are most frequently found in the liver. The spleen is also commonly found affected, as is also the intestinal tract. Lesions have been found less frequently in the skin, bones, joints, gizzard, lungs, peritoneum, ovaries and kidneys.

The lesions in the liver may show as a few scattered nodules, quite small in size and white in color. In other cases the liver may be enlarged and thickly studded with enormous numbers of small nodules, visible alike under the capsule and on the cut surface. In still other cases the nodules are conglomerate, surrounded by a more or less well-defined capsule and sharply differentiated from the surrounding tissue.

Spleen Frequently Affected

The spleen also is very often affected. The nodular type is most frequent. These nodules may be scattered irregularly through the splenic tissue or may appear beneath the capsule, which is distended. Avian tuberculosis may occur also in the spleen as a patchy tuberculosis. This form sometimes resembles the so-called "monkey tuberculosis" of humans, which is believed to occur in individuals very susceptible to tuberculosis. This results in great enlargement of the spleen.

The liver and spleen may be enlarged and show severe secondary changes when numerous nodules are found. In such cases the organs are very soft.

The lymphatic system of birds is apparently not well developed. Nodules are not found, even in tuberculosis in fowls, in places where lymph-glands should be. Occasionally a rather diffuse tuberculosis of the mesentery is found, being manifested by small nodules throughout the mesentery. This makes a rather striking picture when the abdomen is opened.

The intestines very often show isolated and conglomerate nodules varying in size from a pin-head to a hen's egg. The small nodules are imbedded in the intestinal wall, while the larger ones are protruding from the intestinal wall. All intestinal nodules are connected with the lumen of the intestine by a narrow neck and this fistulous tract apparently is continuously discharging large numbers of tubercle bacilli into the feces.

The early tuberculosis prevention and eradication work in this country gave little attention to tuberculosis in poultry, since it was not known to exist to any great extent in the United States, nor was it believed to be of any danger to other farm live stock. It is not believed to be very prevalent in the East or South at the present time. Avian tuberculosis does exist to an alarming extent in the flocks of the Middle West and is causing a great loss to the poultry industry. In some states at the present time, it is believed to be causing a greater economic loss than is bovine tuberculosis.

Relation of Avian Tuberculosis to swine

It has been known for a long time that avian tuberculosis may infect swine. It has been learned quite recently that avian tuberculosis is responsible for a large part of the swine tuberculosis in many sections. Consequently it is now believed that it will be necessary to eradicate avian tuberculosis in order to stamp out swine tuberculosis.

Many instances are on record where tuberculosis of the avian type has been found in a wide variety of farm live stock. The literature, however, is too incomplete to draw very definite conclusions regarding the relation of avian tuberculosis to other farm animals. Avian tuberculosis has stood by itself for a long time as an economic and hygienic problem with the exception of the intertransmissibility of tuberculosis from poultry to swine. It has been found quite commonly in swine. The avian type has also been incriminated in causing tuberculosis in horses. Dr. L. Van Es has shown, in typing experiments, that isolated lymph-gland tuberculosis in bovines may show the avian type. Plum, a Danish investigator, has reported six cases of abortion in cattle which he believed were due to avian tuberculosis.

It is considered more and more probable that avian tuberculosis may occur in a number of different animals. The tubercles in fowls usually contain large numbers of tubercle bacilli and are frequently found along the intestinal tract. This results in

widespread dissemination of numbers of avian tubercle bacilli and, because of the habits of farm-yard fowls, provides abundant sources of infection, not only to fowls but to other farm live stock. The frequency of the avian type in species other than birds is not yet known and its incidence cannot be accurately estimated. Tuberculosis among fowls seems to be increasing. These facts should impress on all the danger of considering too lightly the avian type and that liberties should not be taken with any type of tubercle bacillus.

Avian tuberculosis is rapidly assuming a place of importance in general tuberculosis prevention and eradication programs. This is particularly true in regard to swine. Swine tuberculosis is quite prevalent especially in certain sections of the country. It has been shown that the number of swine retentions for tuberculosis is quite high in some federally inspected abattoirs and amounts to as much as twenty-one per cent of the total hogs slaughtered from some states. Swine tuberculosis is also causing considerable concern because it has been shown that, in areas where bovine tuberculosis has apparently been eradicated, there has been no decrease in the amount of swine tuberculosis as determined from swine retentions for tuberculosis in federally inspected abattoirs receiving hogs from such areas.

Causes Many Retentions in Swine

Avian tuberculosis usually manifests itself as a lymph-gland tuberculosis. It is usually a non-progressive form and hence responsible for retentions rather than condemnations. Sometimes the avian type may cause a generalized tuberculosis in swine although this is not nearly so often the case as where the source is bovine. The eradication of swine tuberculosis must include the eradication of avian tuberculosis.

Avian bacilli show a tendency to produce the so-called Yersin type of tuberculosis, a tuberculous septicemia. Large numbers of bacilli are found throughout the tissues in this type, but without the formation of any tubercles. The reaction in the tissues of other animals to the avian types of tubercle bacillus is not well known and neither is it known whether such reaction is always manifested by tubercles.

The importance of avian tuberculosis economically, its prevalence and its relation to other farm animals makes this disease of great importance to all those connected with live stock.

COMPLETED EXPERIMENTS TO DETERMINE WHETHER AVIAN TUBERCULOSIS CAN BE TRANSMITTED THROUGH THE EGGS OF TUBERCULOUS FOWLS

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The importance of an efficient control of avian tuberculosis is becoming more apparent as we note its spread in poultry and recognize its relationship to tuberculosis in other animals. Inasmuch as the control of any disease must be based upon an intimate knowledge of its dissemination, it becomes necessary to familiarize ourselves with the specific channels of infection and elimination.

Since its earliest recognition as an intestinal infection, it has been generally understood that avian tuberculosis is transmitted largely through the droppings of infected birds. The danger of transmission through the egg is less clearly understood and has been debatable because of the meager experimental data. Nearly all publications on this disease mention the possibility of transmission through the egg. Van Es and Schalk[1] state: "It seems thus that transmission by means of the eggs must be given consideration, although the data are not sufficiently numerous to enable us to correctly estimate the extent of the danger." Gallagher[2] reports: "That eggs of diseased birds frequently contain the microbes and young chicks hatched from such infected eggs are diseased when they leave the shell and soon infect the poultry with which they run." Such a positive statement seems to find support in the following statement[3] by Kiernan: "Case reports made by field veterinarians indicate that there is great danger of spreading avian tuberculosis by shipping day-old chicks."

A survey of the experimental data upon which these and other statements are based is not extensive. The reported experiments of such foreign investigators as Koch and Rabinowitsch,[4] Baumgarten,[5] Maffuci,[6] and Milchner[7] deal almost entirely with the question of determining whether or not eggs artificially infected with viable avian tubercle bacilli will hatch and the incidence of tuberculosis in the chicks hatched therefrom. The data presented by these investigators may be summed up by the conclusions of Milchner, who states that chicks may be infected by expert

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artificial inoculation of eggs with avian tubercle bacilli, but he is not sure whether natural infection occurs in this manner. Although these experiments were conducted by the use of artificially infected eggs, they serve a valuable purpose in demonstrating that eggs containing tubercle bacilli will hatch and further that such chicks will show active infection. In view of such findings it would appear that the danger of transmitting avian tuberculosis by this means is proportionate to the natural infection present in the eggs of tuberculous hens.

The reported bacteriologic examinations of eggs for the presence of natural infection with tubercle bacilli are of interest. Higgins[8] reported that fifteen eggs were received at his laboratory from a flock of fowls in which tuberculosis had been previously diagnosed. Six of these eggs were used for microscopic examination and in three of them tubercle bacilli were demonstrated without difficulty. Eleven guinea pigs were inoculated with material from ten of the eggs (one of the series used for microscopic examination was included in the inoculation experiments), with the result that in two of these animals unmistakable evidence of tuberculosis was found. It should be noted that the fifteen eggs, of which 33⅓ per cent were infected, did not come from known tuberculous birds but from a flock in which the disease was known to be present, and further that the guinea pig is quite resistant to the avian type of tuberculosis.

Mohler and Washburn report the results of inoculating the white and yolk of two eggs into two guinea pigs. Both eggs showed the presence of tubercle bacteria. Autopsy of the hen from which these eggs were obtained showed marked tuberculosis of the spleen, kidneys and lungs, several tuberculous nodules in the liver and numerous nodules scattered over the serous surface of the intestine. It is of interest to note that the authors do not report the presence of tuberculous lesions in either the ovary or oviduct.

As the result of rabbit inoculations, Artault[10] reports the presence of tubercle bacteria in two of twenty-five eggs to be examined. Although this author states: "They (the eggs) were undoubtedly infected in the oviduct," he fails to report the results of autopsy. Gartner[11] infected one male and twelve female canary birds intraperitoneally with a virulent culture of avian tubercle bacteria. From these he got nine eggs. Intraperitoneal inoculation into guinea pigs showed two infected. In a second experiment using

25 canaries, two out of 24 eggs showed the presence of tubercle bacteria.

As the data cited thus far are reviewed, one is impressed by several facts: first, that tubercle bacteria have been found in from 8 to 100 per cent of the eggs examined; second, that artificially infected eggs will hatch; and third, that chicks hatched from infected eggs show the presence of tuberculosis; all of which would indicate the importance of egg-borne infection. In an effort to contribute additional data to the question of egg-infection, Fitch, Lubbehusen and Dikmans[12] examined a total of 876 eggs obtained from 43 tuberculous hens. Three hundred sixty-seven of the eggs were cultured in their entirety, while the remaining 509 were inoculated into susceptible birds. Tubercle bacilli were found in a composite sample of nine eggs. This did not imply that each of these eggs contained the organism. They came from two hens and only an occasional egg was infected. The authors state: "It would be safe to conclude from these results that less than 1 per cent of eggs from tuberculous fowls actually contain living tubercle bacteria." Although these results show a far lower percentage of egg-infection than that reported by Higgins and others, they support the work of these investigators to the extent of showing that eggs from tuberculous birds may and sometimes do contain tubercle bacteria. The significance that may be attached to egg-infection, regardless of the percentage showing infection, depends upon a number of factors before it can be considered to have an important bearing on transmission and subsequent control of the disease. Assuming that a certain percentage of eggs do contain tubercle bacilli, as shown by previous studies, such eggs are an important factor in transmission only in so far as they produce infected chicks. In our studies here reported of the transmission of avian tuberculosis through the egg, observations were made on the following points:

1. The hatchability of eggs which contain tubercle bacilli (artificial infection). 2. The extent of infection and mortality rate of infected chicks (hatched from artificially infected eggs). 3. The actual transmission of the disease through naturally infected eggs, such transmission to be determined by repeated tuberculin tests and autopsy. 4. The influence of tuberculosis on egg-production. 5. The incidence of tuberculous lesions in the ovary or oviduct.

Transmission through Artificially Infected Eggs

The transmission of tuberculosis through infected eggs depends upon the hatchability of such eggs. The question of hatchability therefore becomes the important factor, and can be determined only by a study employing artificially infected eggs. The technic for the inoculation of the eggs was simple. The point of inoculation was about ¼ inch from the end opposite the air sac. This point of entry had the advantage of not puncturing the air sac or introducing the bacilli into the germinal disc which has a more central location when the egg is lying on its long axis. The shell and membrane were punctured by means of a sterile 26-gauge needle. The inoculation was made with a Luer syringe, graduated in minims. The tubercle bacilli injected were in a saline suspension of a culture recently isolated from the spleen of a bird showing generalized infection. One minim of the saline suspension which was dense enough to have a milky appearance was injected into the albuminous portion of each egg. After inoculation the point of injection was touched with a 1-500 bichlorid pack and was later sealed with flexible collodion. According to the technic employed, there is a question as to what extent we may interpret the results obtained in terms of natural infection. There are two criticisms to be offered in that (a) it is difficult to approximate natural infection either as to number or virulence of tubercle bacilli introduced, and (b) the manipulation of the egg in introducing tubercle bacilli may influence the hatchability. In order to determine to what extent such manipulation might influence hatchability in artificial infection, normal saline was introduced into 81 eggs according to the technic already outlined. The normal hatchability of the eggs was determined by the use of 81 norms placed in the same incubator. These eggs were produced about equally by a pen of White Leghorn hens. These birds had been used for breeding purposes by the Poultry Department of the University of Minnesota. The results are summarized in table I:

Table I.—*Tests of hatchability of eggs injected with normal saline solution*

	Number of Eggs	Infertile Eggs	Dead Germs	Eggs Unhatched	Chicks Dead in Shell	Weak Chicks	Healthy Chicks
Inoculated	81	40	15	13	3	1	9
Normals	81	28	10	26	4	4	9

It will be noted that the hatchability resulting in healthy chicks, although exceedingly low, is the same for both groups. It was discovered that through error the male birds had been removed sometime during the period when the 162 eggs were being produced. However, inasmuch as the eggs for inoculation were chosen at random from the group of 162, we believe the end-results are comparable, and show that the manipulation and mechanical injury incident to inoculation have little influence on the hatchability. We may assume from the foregoing that the hatchability of artificially infected as compared with normal eggs will be influenced directly by the presence of the tubercle bacilli injected. In addition to inquiring into the hatchability of artificially infected eggs, we desired to procure data on the distribution of infection in chicks so hatched, as an aid to future examinations of chicks from naturally infected eggs. In this study 156 eggs, selected as before, were placed in incubation. Of this number 78 had been artificially infected with 1 minim of a suspension of avian tubercle bacilli, according to the technic already outlined. The remaining 78 eggs were left as controls for normal hatchability. The results obtained are presented in table II.

TABLE II.—*Tests of hatchability of eggs artificially infected with tubercle bacilli*

	NUMBER OF EGGS	INFERTILE	DEAD GERMS	EGGS UNHATCHED	CHICKS DEAD IN SHELL	CHICKS
Infected	78	15	20	25	4	14
Normals	78	12	9	27	4	26

It will be noted that the results obtained in the study of hatchability of eggs artificially infected with tubercle bacilli differ very markedly from those injected with normal saline. This observation is particularly significant when we note the increase in number of dead germs, and points to the possibility of a similar circumstance in cases of natural infection. The second point of difference is in the number of chicks produced. Inasmuch as bacteriologic examinations showed the presence of enormous numbers of tubercle bacilli in the eggs which failed to hatch, either because of infertility or dead germs, it was assumed that the fourteen chicks which appeared healthy were infected. Two of the fourteen chicks died within 48 hours, seven died between the second and fifth days, four died between the tenth and fifteenth days, while one survived to maturity. It may be stated

briefly that tubercle bacilli were demonstrated in all of the chicks. While no visible lesions were noted in chicks which died before the tenth day, no difficulty was encountered in demonstrating tubercle bacilli in the liver tissue and unabsorbed yolk. One of the chicks which succumbed between the tenth and fifteenth days showed miliary lesions in the liver and spleen. The chick which survived gave a positive tuberculin reaction when approximately four months old. Autopsy showed generalized tuberculosis. Although, as previously stated, one cannot interpret the results obtained by means of artificial inoculation in terms of natural infection, it may be stated positively that some eggs containing tubercle bacteria will hatch and, further, that chicks so hatched will show active infection with the organism. The influence of tubercle bacteria on the hatchability of eggs, as determined from artificial infection, indicates that many would fail to hatch because of destruction of the embryo. It is further shown that in the case of infertile eggs containing tubercle bacteria, when incubated, the germs multiply and can easily be demonstrated on smear.

Transmission by Means of Naturally Infected Eggs

Following the preliminary work with artificially infected eggs we began in February, 1926, our study of transmission through natural infection. Tuberculin-reacting hens were obtained from a number of flocks which had shown a relatively high percentage of infection. Each bird was leg-banded and trap-nested. The eggs procured were marked with the number of the hen and the date of laying. The incubator record included notations on each egg as to fertility, dead germs, unhatched eggs, chicks dead in the shell, and chicks hatched. Eggs from each hen were placed in pedigree bags, in order to identify the chicks which were in turn leg-banded. All chicks which died were carefully autopsied and subjected to a thorough bacteriologic examination. Histo-pathologic examinations were made when such were deemed necessary as an aid in diagnosis. All chicks were raised on new ground under strict confinement. As soon as the young birds had reached an age when the wattle development warranted an intelligent interpretation of the tuberculin test, this method of diagnosis was applied, and in some instances repeated.

In this work 145 reacting hens of several breeds were used. It was found that the data procured from this flock justified a division into three groups to aid in clearness of presentation and interpretation, namely: (A) birds which produced chicks, (B)

birds producing eggs which failed to hatch, and (C) birds which failed to produce eggs. While it is obvious that we must base our conclusions relative to actual transmission on the data of group A, we find the data of groups B and C of value in our consideration of such important factors as the influence of tuberculosis on egg-production and hatchability, also the incidence of tuberculous lesions in the ovary and oviduct.

GROUP A

The data procured from this group of 88 tuberculin-reacting hens is presented in part in table III. It has not been deemed essential to the conclusions which may be drawn therefrom to include the complete incubation record of the eggs. The notations on the number of chicks hatched will suffice to warrant conclusions on hatchability.

A total of 697 chicks were hatched from a season's production of 2000 eggs from 88 tuberculin-reacting hens. Of this number 487 died and were subjected to a most careful bacteriologic examination. The others (209) were tuberculin-tested and autopsied. Tuberculosis was not found in any chicks. These results very clearly indicate that transmission of tuberculosis through the egg rarely if ever occurs. Recognizing that infected (artificial) eggs may and sometimes do hatch, we must view the negative results here reported as further evidence that natural infection of eggs with tubercle bacteria is *not* common, and a negligible factor in the transmission of this disease. A survey of the autopsy records of the 88 hens of this group shows a tuberculous infection which, in approximately 90 per cent, may be designated as mild. It should be noted that the egg-production of such birds as numbers 6, 10, 17, 203, 78, 80, 90 and 110, showing more severe infection, does not compare favorably with the remainder of the group.

Additional data on the influence of tuberculosis on egg-production and hatchability will be presented by groups B and C. Regardless of the extent of tuberculosis and its influence on egg-production, we are primarily interested in the incidence of tuberculosis in those organs concerned with egg-production, and upon which natural infection may depend, namely, the ovary and oviduct. The autopsy records of the birds in this group show two cases of infection of these organs. Bird 251 showed three pea-sized lesions in the wall of the oviduct. Bird 140 had a tuberculous mass involving the major portion of the ovary. At the time

TABLE III.—*Tuberculin-reacting hens, the eggs of which produced live chicks*

HEN	EGGS SET	CHICKS HATCHED	CHICKS DIED AND AUTOPSIED	CHICKS TUBERCULIN TESTED AND AUTOPSIED	AUTOPSY OF HEN FOR TUBERCULOUS LESIONS
E521	58	30	18	12	One small lesion in liver
215	25	11	5	6	Miliary lesions in liver; nodules in spleen
222	24	14	10	4	One small lesion in liver
231	21	1	1	0	Two 6-mm. lesions in liver
236	42	19	16	3	A few spleen and intestinal lesions
266	60	19	14	5	One 5-mm. lesion in liver
268	46	2	2		Extensive involvement of liver, spleen and intestine
278	19	4	1	3	Two large nodules in liver
1	31	17	9	8	One small lesion in liver
2	44	11	6	5	One small lesion in liver
5	31	22	9	13	Three small lesions in the spleen
6	17	4	4	0	Extensive involvement of liver, spleen, intestines and lungs
7	40	13	7	6	One 5-mm. lesion in liver
8	29	7	3	4	One small lesion in liver
9	17	8	6	2	Two small lesions in the liver
10	12	3	2	1	Extensive involvement of liver, spleen and intestine
11	50	23	16	7	Several small lesions in liver
13	47	14	7	7	A few lesions in liver and intestines; extensive involvement of the spleen
15	15	2	1	1	Several small lesions in liver
16	28	6	5	1	Miliary lesions in liver
17	9	2	1	1	Extensive lesions in liver, spleen and intestines
18	28	1	0	1	Miliary lesions of liver and spleen
19	14	8	2	6	Extensive lesions in liver and spleen
20	16	2	2	0	Two small lesions in liver
21	52	5	3	2	Two small lesions in liver
22	21	6	5	1	Several lesions in liver and on intestine
203	15	6	3	3	Generalized tuberculosis
204	53	25	11	14	One small lesion in liver
212	43	27	8	19	One 4-mm. lesion in liver
213	44	31	19	12	One small lesion in liver
219	10	7	2	5	Tuberculosis of right femur
251	17	5	3	2	Extensive tuberculosis of *cloaca;* miliary lesions in the liver and extensive involvement of the intestine
256	40	13	12	1	Miliary lesions in the liver
267	49	23	12	11	Miliary lesions in the liver
284	22	3	0	3	Three small nodules in liver and spleen
286	31	7	7	0	Several small lesions in liver
59	20	3	3	0	One small lesion in liver
62	18	13	10	3	One 6-mm. lesion in liver
63	24	3	3	0	Numerous small lesions in liver
64	21	10	7	3	One small lesion in spleen
65	12	6	5	1	Two small lesions in spleen
66	23	7	6	1	One small lesion in liver and spleen
68	31	14	12	2	Miliary tuberculosis of the spleen
69	21	7	7	0	One small lesion on intestine
70	7	1	1	0	Extensive lesions in liver and spleen

TABLE III.—*Continued*

75	24	1	1	0	Several small nodules in liver
76	16	3	2	1	Miliary lesions in liver
77	14	3	2	1	One small lesion in liver
78	1	1	1	0	Extensive involvement of liver, spleen and intestine
80	16	7	6	1	Extensive involvement of liver, spleen and gizzard
83	9	3	3	0	One small tubercle in liver
84	3	1	1	0	One small tubercle in liver
87	20	5	4	1	One small tubercle in spleen
90	17	10	8	2	Extensive involvement of the liver and spleen
97	8	4	4	0	Several small lesions in liver
99	8	2	2	0	One small lesion in liver
100	14	5	3	2	One small lesion in liver
101	19	6	6	0	Small tubercles in liver and spleen
102	18	3	2	1	Several small lesions in liver
104	35	11	10	1	Extensive tuberculosis of liver and intestines
106	44	25	20	5	Several small lesions in liver
107	2	1	1	0	One small lesion in spleen
110	16	5	5	0	Extensive involvement of liver and gizzard
111	18	1	1	0	Several small nodules in liver and spleen
113	18	10	10	0	Four small nodules in liver, two in spleen, and one on intestine
114	30	10	8	2	Extensive involvement of spleen and intestines
115	18	5	5	0	One small lesion in liver and spleen
117	30	11	10	1	One small lesion in liver
118	8	2	1	1	Two small lesions in liver; several small nodules in spleen
119	8	4	4	0	Several small lesions in liver
121	17	6	6	0	Several small lesions in liver and spleen
125	19	7	6	1	Several small lesions in liver
129	6	3	2	1	Miliary tuberculosis of liver
131	18	2	2	0	Several small lesions in liver and spleen
132	21	6	6	0	Three small lesions in spleen
135	17	4	3	1	One small lesion in spleen
139	24	9	8	1	Extensive involvement of liver and spleen
140	1	1	1	0	Tuberculosis of *ovary;* several small lesions in liver
141	29	10	7	3	Miliary lesions in liver
146	40	9	8	1	One small lesion in liver and spleen.
148	11	3	3	0	Several small lesions in liver
149	11	5	3	2	One small lesion in liver
150	12	1	1	0	Several nodules in liver and spleen
152	14	7	7	0	Extensive tuberculosis of liver and spleen
154	10	2	1	1	Two 8-mm. lesions in liver
157	9	5	5	0	Several small lesions in liver; extensive tuberculosis of intestine and mesentery.
159	28	12	11	1	Several small lesions in liver
160	2	1	1	0	Several snall lesions in liver and spleen
Totals 88	2000	697	487	209	

of slaughter the ovary was inactive. The egg which was produced by this bird hatched, but failed to show positive evidence of infection. The fact that the only case of positive ovarian infection which we encountered produced but a single egg raises the question of whether or not a tuberculous ovary will produce many eggs. Unfortunately we have no means of determining the extent of ovarian infection at the time bird 140 produced the egg in question.

Group B

This group comprises 16 tuberculous birds, the eggs of which failed to hatch. The data comprising the incubation record and autopsy of these birds are presented in table IV. The eggs

Table IV.—*Tuberculin-reacting hens the eggs of which failed to hatch*

Hen	Eggs Set	Infertile Eggs	Eggs Having Dead Germs	Eggs Not Hatched	Chicks Dead in Shell	Autopsy of Hen for Tuberculous Lesions
82	1	0	1	0	0	Extensive tuberculosis of liver and spleen
88	7	1	1	4	1	One small lesion in liver
89	1	1	0	0	0	Miliary tuberculosis of liver and spleen
94	4	2	2	0	0	Two small tubercles on intestine
96	14	11	3	0	0	Miliary tuberculosis of liver; extensive involvement of intestine
103	4	1	2	1	0	One small lesion in liver
108	4	2	1	1	0	One 6-mm. lesion on intestine
122	4	4	0	0	0	Miliary tuberculosis of liver and spleen
127	6	5	0	0	1	Several small lesions in liver. Two nodules in spleen
128	1	0	0	1	0	One small lesion in liver
137	22	22	0	0	0	Extensive involvement of liver, spleen and intestine
138	2	2	0	0	0	Extensive involvement of liver, spleen and intestine
143	2	0	1	1	0	One small tubercle in liver
153	4	4	0	0	0	Miliary tuberculosis of liver
156	7	1	4	2	0	Miliary tuberculosis of liver; severe involvement of spleen
224	4	2	2	0	0	One small tubercle in liver; several nodules on spleen and intestines
16	87	58	17	10	2	

designated as infertile were those failing to show a developing germ after seven days of incubation. Eggs showing dead germs were removed on the seventh and fourteenth days of incubation.

Those eggs which are tabulated under the heading, "Not hatched," are those having a dead embryo during the last seven days of incubation.

The data obtained from artificially infected eggs indicated that the presence of tubercle bacteria in many instances inhibited the development of the embryo and produced a relatively large number of "dead germs." In this group showing no hatchability we were particularly interested to determine the cause and to note whether or not the extent of tuberculosis in these birds influenced the results obtained. From the data of group B we find that 58 (66.6 per cent) of the 87 eggs were infertile, while only 17 (19.5 per cent) presented dead germs during the first fourteen days of incubation. A study of the autopsy records of these birds shows the presence of tuberculous infection which is no more severe than that encountered in group A. These observations would indicate that the lack of hatchability in this group cannot be attributed to or correlated with the extent of tuberculous infection present in the bird.

GROUP C

Inasmuch as the data of group B would tend to indicate that tuberculous infection in the bird has very little influence on hatchability, we are interested in the data of table V, presenting the autopsy records of the 41 birds which failed to produce eggs, in order to denote the influence of tuberculosis on egg-production.

It will be noted that the birds which failed to produce eggs may be divided into two groups, namely, those which died either as the result of tuberculous infection or some other cause, and those which were killed because of non-production. It should be stated that those birds which were killed had been held under observation for a period of five months, which we believe was ample for the purpose of classifying them as non-producers. It is not surprising that the birds of this group show a greater percentage of severe infection, which was sufficient in some instances to cause death. On the other hand there are numerous instances in those birds which were killed where only a single lesion was found or, as in birds 134 and 151, infection was demonstrated only after microscopic examination. In considering the autopsy results of the birds in groups A, B and C, we believe that we are justified in the statement that egg-production is seriously curtailed in those birds showing extensive infection. We recognize that some individuals of group A with a fair production record showed

extensive tuberculosis on autopsy, but in many of such instances the autopsies were performed after production had ceased for some time.

Discussion

As a result of this study and that previously reported,[12] we must view the danger of transmission of tuberculosis through

Table V.—*Tuberculin-reacting hens which failed to produce eggs*

Hen	Autopsy of Hen for Tuberculous Lesions
*4	Miliary tuberculosis of the liver
26	One small lesion in the spleen
57	Several small lesions in the liver
*67	Miliary tuberculosis of the liver
71	Several small nodules in the liver, spleen and intestines
73	Several small tubercles in the spleen; one tuberculous mass on the intestine
*74	Extensive involvement of the liver and spleen
*79	Miliary tuberculosis of the liver and spleen
81	One 6-mm. lesion in the liver
*85	Large tuberculous mass involving one of the ceca
86	Extensive involvement of the liver and spleen
91	Extensive involvement of the liver, spleen and intestines
*92	Miliary tuberculosis of the liver and spleen
93	One small nodule in the liver
95	A few small lesions in the liver
105	Miliary tuberculosis of liver and spleen; one large tuberculous nodule in the gizzard
109	Extensive involvement of liver and spleen
*112	Too decomposed for autopsy
*116	One small lesion in liver; death due to peritonitis
120	Several small lesions in the spleen
123	Miliary tuberculosis of liver; one small nodule in spleen
124	Tuberculosis of the left femur
126	Numerous small nodules in liver and spleen
130	Extensive tuberculosis of the liver, spleen and intestine
133	Extensive tuberculosis of the liver, spleen and intestine
134	No gross lesions of tuberculosis; tubercle bacteria demonstrated by microscopic examination of the liver
136	A few small lesions in liver and spleen
142	Miliary tuberculosis of the liver and spleen
144	Several small lesions in liver; two small nodules in spleen
145	Extensive involvement of liver, spleen and intestine
*147	Extensive involvement of liver and intestine
151	No gross lesions of tuberculosis, tubercle bacteria demonstrated by microscopic examination of liver
155	Tuberculous peritonitis
161	Severe involvement of liver and spleen
*217	Severe involvement of liver, spleen and intestine
*228	Several nodules in the spleen
254	Tuberculosis of the lung and kidneys
*261	Extensive involvement of the liver and spleen
*269	Extensive involvement of liver, spleen and intestines
276	Extensive involvement of liver, spleen and intestines
*281	Generalized tuberculosis

Note: Those birds marked with an asterisk (*) died from natural causes. All others were killed, either because of unthrifty condition or lack of egg-production over a period of five months.

naturally infected eggs as of little practical consequence. Our bacteriological studies do not support the view held by some that eggs from tuberculous birds frequently contain tubercle bacteria, nor do we believe that the danger of spreading avian tuberculosis through shipment of day-old chicks has any basis in fact. The transmission of tubercle bacteria through the eggs of a tuberculous bird depends upon a combination of circumstances which renders the probability of such infection very remote. First, we must consider the influence of tuberculosis on egg-production, and recognize that badly infected birds often fail to produce. In our own stock, 41 of 145 (27 per cent) failed to produce eggs, and if we include those birds which produced eggs which failed to hatch, we find that 40 per cent of this group of 145 birds failed to produce chicks. As previously stated, we cannot attribute this non-production or non-hatchability entirely to tuberculosis infection, but it was undoubtedly an influencing factor. Those who have made detailed autopsy records on 100 or more cases of avian infection report the presence of lesions in the ovary or oviduct in percentages ranging from considerably less than 1 up to 3 per cent. Of the 145 autopsies here reported, only two birds (140 and 251) showed infection in either of these organs. We have shown that some eggs do contain tubercle bacteria, but that they occur in less than 1 per cent of the eggs of tuberculous hens. If we interpret the results obtained by artificial infection in terms of natural infection, it may be stated that although some may hatch and thus transmit the organism, the normal hatchability is greatly decreased by destruction of the embryo. Assuming that a certain number of infected eggs do hatch, the danger of these acting as disseminators of the infection depends upon their survival. Only one of the 14 chicks hatched from artificially infected eggs survived after fifteen days, and would have become a menace to flock infection. These experimental results and the soundness of our present methods of control are supported by extensive autopsy and tuberculin-test results on those birds under nine months of age, which show very little or no infection. This common observation has led to control measures by which birds two years or over are disposed of.

We should keep in mind that eggs do rarely contain tubercle bacteria. If such eggs are incubated, the number of bacteria is greatly increased. Such eggs are a real menace if not properly

disposed of by burning or deep burial. Birds or pigs allowed to eat such uncooked eggs may become infected with avian tuberculosis.

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CLINICAL AND CASE REPORTS

(Practitioners and others are invited to contribute to this department reports of unusual and interesting cases which may be helpful to others in the profession.)

LOSSES IN CATTLE LIVERS OCCASIONED BY FLUKES

By J. STOTCHIK, *Houston, Texas*

Veterinary Inspector, Meat Inspection Division, Bureau of Animal Industry, U. S. Department of Agriculture

It may be said that there are two cardinal principles in the production of meat: First, it must be fit for food and, second, it must be produced as economically as is possible. Meat that is unhealthful is, of course, unfit for food. It is obviously also uneconomical. It represents waste and is a direct challenge to the stockman and the meat-packer, and should be to the public in general.

There are many elements of waste with which the stock-raiser and the packing industry have to reckon. Of these the diseases of live stock are, perhaps, the most formidable. There is the tangible waste represented by condemned carcasses and parts of carcasses and it amounts to a goodly sum annually. But there is also a sort of intangible waste, the sum total of which is doubtless very great. It is represented by lack of proper development of the individual animal due to disease interference, and also by retrograde body changes occasioned by disease, changes which when not of a nature to cause condemnation of the whole or part of a carcass are still potent enough to lower both the quantity and the quality of the meat.

As a steady contributor of waste in the packing industry the liver fluke is deserving of some attention. It is directly responsible for the condemnation of a great many livers and it is also responsible for even greater indirect losses.

There are many species of flukes, and a number of these affect cattle, horses, sheep, goats, swine and persons. This article deals with the common sheep liver fluke which affects cattle, sheep, goats and swine.

Like many other creatures capable of causing considerable harm, this fluke is an innocent-looking individual. It is flat,

leaf-like, about an inch long and one-third of an inch wide, light brown in color and covered with minute spines that point backward. It bears the scientific name *Fasciola hepatica*, or in the older texts *Distomum hepaticum*. The scientists who thus named and classified the fluke also trailed it through the various stages of development and so its life history is known. It can be found fully described in any standard work on parasitology but it may, perhaps, be well to mention here some of the high lights.

On its way through life the fluke stops at several way stations. It lays eggs, which are, of course, very minute and are capable of hatching only in damp places. When hatched the embryos must get into the body of a fresh-water snail for further development. Here the fluke attains the infective larval stage. The larvae leave the snail and may become attached to grass or water plants. In this position they can survive for a long time if the environment remains moist. The important thing in the life of a fluke is plenty of moisture and warmth. For this reason the greatest infestation is found on the warm low-land pastures. Animals ingest the larvae of the fluke by grazing on infested pastures, drinking contaminated water or feeding on freshly cut fluke-contaminated grass.

Once in the digestive tract, the larvae find their way into the liver and take possession. Here they become fully-grown flukes, lay their eggs and otherwise make themselves at home. With the bile the eggs reach the intestinal canal and pass in the manure to the outside world to start the cycle all over again. The adult flukes in the liver set up inflammation everywhere they go. Traces of them are often found under the liver capsule and this gives the liver a pock-marked appearance, the surface being studded with bluish pits of varying sizes. If the invasion is of recent origin the liver may appear normal and the flukes can be found only upon cutting open the bile-ducts. In older cases the bile-ducts become enlarged, standing out as hard, yellow cords, and the liver in general may assume a very repulsive appearance due to indurations and abscesses.

Flukey livers are unfit for food because of the presence of the parasites, their toxic products and the inflammation set up in the liver tissue. In accordance with the regulations of the Bureau of Animal Industry, such livers are condemned.

The parasite is very commonly found in the meat inspection work in southern packing houses, and the number of flukey

livers found here is truly surprising. In Houston, Texas, out of 5,943 beef livers examined from May to September, 1927, inclusive, 4,069 (about 68.5 per cent) were found to be fluke-infested and were condemned. Assuming the average weight of a beef liver as 10 pounds, and the average wholesale price as 12 cents per pound, the loss in this instance alone amounts to the imposing sum of $4,882.80.

Add to this the fact that calves, even quite young calves, are also affected with flukes, though not so uniformly as adult cattle, and some idea may be gained of the direct, the tangible, losses occasioned by flukes affecting cattle. It would be difficult, indeed, to estimate the indirect or intangible losses due to the same source, but it may safely be assumed that these losses are very large.

WHAT WILL OUR NEW NAME BE?

I

Will we be Beastopaths, or Animal Engineers,
Doctors of Animal Industry, or Zooseers?
Don't you want to be a Cowpractor,
And let them see the tractor
Has not done away with the *Veterinarian?*

II

Let's all be Animal Physicians,
Or Zoölogical Dieticians,
Or let's all become Pighealers,
And just doctor none but squealers,
To prove that there are still some *Veterinarians.*

III

Let's all be Caninologists,
Or Doggy Dermatologists,
Or Avian Pathologists,
And daily make our calling lists.
Who wants to be a *Veterinarian?*

L'Envoi

"Hoss Doctor" is passé,
But we'll never see the day
When there won't be any *Veterinarians.*
Friend Public won't forget,
But will still call us his "Vet,"
When his live stock needs a *Veterinarian.*

—*Knight Awdlee Hughes.*

ARMY VETERINARY SERVICE

CHANGES RELATIVE TO VETERINARY OFFICERS

Regular Army

Captain Patrick H. Hudgins has been relieved from observation and treatment at the Walter Reed General Hospital, Army Medical Center, Washington, D. C., and directed to proceed to his home to await retirement.

Captain Daniel S. Robertson has been relieved from duty at Fort Douglas, Utah, and directed to report to the commanding officer, remount purchasing and breeding headquarters, Fort Douglas, Utah, for duty and in addition will render the necessary veterinary services for the R. O. T. C. unit at the University of Utah and Fort Douglas, Utah.

Reserve Corps

New Acceptances

Fletcher, R. Frank	Captain	Platteville, Wisconsin.
Strait, Perl F.	Captain	301 S. Water St., Sparta, Wis.
Hansen, F. Wm.	1st Lt.	Wittenberg, Wis.

Promotions

Powell, Arthur J.	Captain	711 6th Ave., Lewiston, Idaho.
Keehn, Wm. Gustav	Captain	625 New Nelson Bldg., Kansas City Mo.

Separations

Brown, Philip	2nd Lt.	Resignation accepted, Dec. 3, 1927.

EXAMINATION FOR APPOINTMENT IN THE VETERINARY CORPS, REGULAR ARMY

Examination for the purpose of qualifying candidates for appointment in the Veterinary Corps, Regular Army, will be held beginning June 18, 1928, throughout the continental United States.

The applicant must be a male citizen of the United States, between the ages of 21 and 29 9-12 years, and a graduate of a recognized veterinary college.

Application blanks, Form No. 62, A. G. O., may be obtained from The Adjutant General or from The Surgeon General, U. S. Army, Washington, D. C., or from the Commanding Officer or Surgeon of any military post or station, and when completed should be forwarded direct to The Adjutant General, U. S. Army, Washington, D. C.

Any veterinarian desiring to take the examination should obtain the necessary application blank and submit it at the earliest practicable date.

COMMUNICATIONS

To the Editor:

Herewith a money order for $5.00 as my contribution to the Association. Continue your good work. I believe everybody is proud the way the Association is governed and the way the Journal is being conducted.

J. L. Trudeau.

St. Boniface, Man., December 5, 1927.

PRESIDENT HILTY AT LINCOLN

To the Editor:

The annual meeting of the Nebraska State Veterinary Medical Association, which closed yesterday, was a complete success in every way. There was the largest attendance in the history of the Association.

Judging from comments of individual members, the increase in attendance was due in a large measure to the presence of Doctor Hilty, president of the A. V. M. A. It was pleasing to note that he measured up to their expectations. Besides functioning in a creditable manner as the chief speaker at the banquet, he made himself at home during the regular program by taking part in the discussions. It seems that the contact established between our national and our state organization by Doctor Hilty was well worthwhile and it is hoped that it will be possible in the future to have the A. V. M. A. officially represented at each annual meeting of our State Association.

F. Perrin,

Lincoln, Nebr., Dec. 15, 1927. *A. V. M. A. Resident Secretary for Nebraska.*

TUMOR SPECIMENS WANTED

To the Editor:

I am making a study of comparative tumor pathology and I am most anxious to secure tumor specimens from various lower animals. I shall appreciate any help you can give me in obtaining such specimens or in bringing my request before the members of the American Veterinary Medical Association.

The specimens could be shipped to me, by express, in containers holding formalin, and I would gladly pay all charges for transportation. The formalin solution can be prepared by adding one part of commercial formalin to three parts of water. In lieu of formalin, any other tissue preservative could be used.

GEORGE T. PACK, M. D.
Professor of Pathology,
University of Alabama.

University, Ala., Dec. 29, 1927.

SHORT OF VETERINARIANS

TO THE EDITOR:

Enclosed find my check for the dues for 1928. Have been awfully busy all fall or would have sent it in before. We are at a standstill in Dakota for we have had winter for thirty days and I guess it is going to be with us till spring too. We have been snowbound here since the first of the month and can not move a car at all, and with a blizzard every few days and the temperature down to 20 below most of the time, you can be happy you live in a good country.

Well, I am closing another good year and it has been a busy one for me, with lots of work and collections good. In fact, there was too much work at times. We are short of veterinarians out here and so our trips are long ones. Outside of all this we are sitting on the top of the world, as the radio says.

More of the veterinarians here in South Dakota should belong to the A. V. M. A. We are going to try and help Minneapolis give you a real welcome next summer.

Wishing you a happy New Year, I am as ever,

G. P. MCCUE.

Aberdeen, S. D., December 31, 1927.

WORTH FIVE DOLLARS

TO THE EDITOR:

Enclosed find $5.00 for my dues for the year 1928. The issue of the JOURNAL containing the proceedings of the annual meeting of the United States Live Stock Sanitary Association was alone worth $5.00.

S. L. RIES.

Mason City, Iowa, Jan. 6, 1928.

BUSINESS COURSES FOR VETERINARY STUDENTS

To the Editor:

In some of the English medical schools they are giving courses to medical students on the general conduct of practice. Such lectures are generally given by some outstanding general practitioner, whose experience and training make him competent to discuss such an important problem. We hope that the deans of our veterinary colleges will consider this matter and see if it is not practical and beneficial to have such lectures for veterinary students. We also think that lectures on the business side of practice would be of much benefit to veterinary students. It has been our observation that the majority of veterinary students are not properly posted in the business side of practice. They get this training by experience, but, as Josh Billings says, "Experience is a good teacher but the tuition is pretty high."

N. S. Mayo.

North Chicago, Ill., January 12, 1928.

MOST VALUABLE PUBLICATION

To the Editor:

Please find enclosed my check for $5.00 to cover A. V. M. A. dues for the year 1928. I consider the Journal as now published the most valuable of veterinary publications.

A. C. Johnson.

Cedar City, Utah, Jan. 14, 1928.

ASSISTANCE APPRECIATED

To the Editor:

It gives me much pleasure in behalf of the officers of the American Red Cross to acknowledge our indebtedness to you for the valuable assistance you gave during our Eleventh Annual Roll Call, by presenting in the pages of the Journal of the American Veterinary Medical Association our invitation to the people of the nation to participate in Red Cross service through membership.

Thank you very much for your cordial and generous cooperation. You contributed materially to the success of our membership campaign.

Douglas Griesemer,
Director Public Information,

Washington, D. C., January 18, 1928. The American Red Cross.

MISCELLANEOUS

DR. A. W. MILLER NOW CHIEF OF PACKERS AND STOCKYARDS DIVISION

Dr. A. W. Miller, for the last ten years chief of the Field Inspection Division of the Bureau of Animal Industry of the United States Department of Agriculture, has been selected by Secretary Jardine to fill the position recently left vacant by the resignation of John T. Caine III, who was in charge of the Packers and Stockyards Administration.

DR. A. W. MILLER

As chief of the Packers and Stockyards Division, Dr. Miller will continue to work under the direction of Dr. John R. Mohler, chief of the Bureau of Animal Industry, inasmuch as the former Packers and Stockyards Administration has been made a division of the Bureau, comparable to the Tuberculosis Eradication, Tick Eradication and Meat Inspection divisions. His appointment became effective January 4, 1928.

Dr. Miller was brought up on a ranch in central Kansas and during his twenty-six years of service in the Bureau of Animal Industry gained a wide experience in meat inspection at packing-

houses and in the control and eradication of live stock diseases in various parts of the country, including the range. During the past ten years he has been the chief of the Field Inspection Division of the Bureau of Animal Industry, which is directly responsible, under the chief of the Bureau, for the enforcement of laws and regulations relating to the exportation and importation of animals, animal products, feed, etc., also the interstate movement of animals, the enforcement of the 28-hour law, and the inspection of animals arriving at public stockyards.

As chief of the Packers and Stockyards Division, Dr. Miller will be charged with the enforcement of an act to regulate interstate and foreign commerce in live stock, live stock products, dairy products, poultry, poultry products, and eggs.

In making the appointment, Secretary Jardine said, "I feel that Doctor Miller's experience and intimate knowledge of live stock matters, especially the transportation and marketing of live stock and packers' and stockyard companies' methods, fits him especially well to assist Doctor Mohler in the enforcement of the Packers and Stockyards Act."

AN INVITATION TO THE LADIES

By MRS. JAS. D. GROSSMAN, *Columbus, Ohio*

When the Secretary asked me to write an article pertaining to the Auxiliary, for the JOURNAL of the A. V. M. A., I thought, "Well, here is an opportunity to tell all those ladies, who are eligible to belong to our Auxiliary, just how much they are missing." So, it is those who are not now members whom I really wish to reach.

We are all proud of our husbands' profession and we can assist a great deal in keeping it at the high standard that they wish, by our loyal support through the Auxiliary. The dues of one dollar that we pay each year are for the Student Loan Fund, which enables a number of worthy senior students in accredited veterinary colleges to complete their course in veterinary medicine, otherwise they might have to discontinue their work, and very fine men would be lost to the profession.

The officers of the Auxiliary give their time and energy to this work gladly, for they have already seen such splendid results.

The Auxiliary not only helps others, but it helps ourselves. All those who have the opportunity to attend the A. V. M. A. meetings will gain a greater insight into the really worthwhile

work the Auxiliary is accomplishing and will greatly enjoy the associations with the other ladies of the A. V. M. A.

If you have never attended any of the A. V. M. A. meetings, plan your vacation this summer to include the meeting in Minneapolis, August 7-10, for there is no more ideal place to spend your vacation than in Minnesota. I know those who attend each year are looking forward to meeting each other there, and we hope to see a lot of new faces, too, for the Auxiliary needs you, and after you become a member you will realize how you have needed the Auxiliary.

HOG FLU PREVENTED BY GOOD HOUSING

Every year for the last decade numerous outbreaks of hog flu, or infectious bronchitis, have been reported among hogs, especially in the Middle West. Outbreaks commonly begin late in the fall, when the weather becomes cold and stormy. Exposure is a contributing cause and hogs affected with the flu sometimes die through the development of pneumonia.

In response to requests for aid in combating these conditions veterinarians of the Bureau of Animal Industry, United States Department of Agriculture, point out that hog flu resembles in its symptoms what is known among people as colds. The application of proper hygienic measures is the most important procedure in treating the disease. Hogs that are provided with clean, dry, well-ventilated quarters, free from drafts and dust, usually recover promptly. Plenty of dry bedding, a reduced ration of easily digested feed, and a constant supply of good drinking water are likewise beneficial in hastening recovery. Prostrated herds with all the symptoms of flu sometimes recover in a few days when housing conditions have been made favorable.

Commenting on reports that some veterinary practitioners have found the aggressin treatment effective in combating hog flu, department veterinarians say the value of the aggressin treatment for this disease is not yet positively established. Scientifically, an aggressin should be administered, before the attack of a disease, to fortify the threatened animals against the disease producedby the type of organism from which the aggressin was prepared. In the case of hog flu the causative organism has not been determined.

It appears that the aggressin which certain practitioners have used in treating hogs affected with flu is not a true flu aggressin,

but is the aggressin used for immunizing hogs against hemorrhagic septicemia. Improvement noted in the condition of herds so treated may have been due to better care of the herds under treatment rather than to the treatment itself.

—*U. S. Department of Agriculture.*

PROF. C. O. JENSEN

Prof. C. O. Jensen, of Copenhagen, Denmark, was elected to honorary membership in the American Veterinary Medical Association, at the recent meeting in Philadelphia. He has been similarly honored by the National Veterinary Associations of Denmark, Norway, Sweden, Finland and Great Britain and Ireland. Prof. Jensen has been Director of the Veterinary Serum Laboratory since 1908 and Chief Veterinary Officer of Denmark since 1922.

He has been co-editor of the *Maanedskrift for Dyrlaeger* (Danish Veterinary Review) since 1889. The University of Copenhagen conferred the degree of Doctor of Medicine (*honoris causa*) on Prof. Jensen in 1910 and two years later he received the degree of Doctor of Veterinary Medicine (*honoris causa*) from the University of Berlin.

AMERICAN VETERINARY MEDICAL ASSOCIATION

Minutes of Special Meeting of the Executive Board of the A. V. M. A.

A special meeting of the Executive Board of the A. V. M. A. was held at the Hotel La Salle, Chicago, Ill., Wednesday evening, November 30, 1927, at 8:00 p. m.

The following were in attendance:

Members of the Board:
Dr. George Hilton, District No. 1
Dr. T. E. Munce, District No. 2, Chairman.
Dr. L. W. Goss, representing District No. 3, in place of Dr. David S. White.
Dr. John R. Mohler, District N . 4.
Dr. C. H. Stange, District N . .
Dr. J. R. Beach, representing District No. 6, in place of Dr. Geo. H. Hart.
Dr. R. S. MacKellar, Member-at-Large.
Dr. Reuben Hilty, President.
Dr. M. Jacob, Treasurer.
Dr. H. Preston Hoskins, Secretary-Editor.
Dr. C. E. Cotton, chairman, and Dr. C. P. Fitch, secretary of the Local Committee on Arrangements for Minneapolis meeting.
Dr. T. H. Ferguson and Dr. N. S. Mayo, of the special committee appointed to study the proposal to secure additional help for the Secretary-Editor.

Dr. Mohler reported the results of his investigations in the matter of having the American Veterinary Medical Association incorporated in some state where the laws were rather liberal and would not require that meetings of the Association be held or the official headquarters of the Association located in the state in which the Association was incorporated. Dr. Mohler reported that he had secured legal advice in the matter and it appeared that the most favorable place for having the Association incorporated was the District of Columbia. Dr. Mohler submitted extracts from the laws regulating the incorporation of benevolent and educational societies in the District of Columbia. Dr. Mohler then moved that proper steps be taken to have the A. V. M. A. incorporated under the laws of the District of Columbia. The motion was seconded by Dr. Stange and carried.

The Secretary called attention to the fact that the name "JOURNAL of the American Veterinary Medical Association" was not registered as a trade-mark and there was the possibility that the name might be infringed upon. Dr. Goss moved that the chairman of the Board be empowered to appoint a special committee to secure registration of the name "JOURNAL of the

American Veterinary Medical Association." The motion was seconded by Dr. Mohler and carried.

Dr. Stange then presented the following report of the committee appointed by Chairman Munce to study, for the Executive Board, the proposal to secure additional help for the Secretary-Editor. Dr. Stange reported that two members of the committee, Drs. R. S. MacKellar and N. S. Mayo, had visited the Secretary's office on Monday, November 28, for the purpose of making an inspection of the most pressing needs. A meeting of the committee had been held in Chicago the following day, November 29, at which the entire question had been very thoroughly discussed. The report follows:

The committee recommends:

1. That a veterinarian be employed on full time as assistant to the Secretary-Editor.
2. That the advertising rates of the JOURNAL be increased 25 per cent.
3. That additional office space be secured.
4. That steps be taken towards securing a permanent home to be owned by the Association.
5. That special efforts be made to secure additional subscribers to the JOURNAL, both foreign and domestic.
6. That special efforts be made to secure additional advertising.

Respectfully submitted,

(Signed) C. H. Stange, *Chairman*
(Signed) N. S. Mayo
(Signed) R. S. MacKellar
(Signed) M. Jacob
(Signed) T. H. Ferguson

November 29, 1927.

Dr. Stange moved that the report be adopted. The motion was seconded by Dr. MacKellar and carried.

Dr. Stange then moved that the chairman of the Board be authorized to appoint the necessary sub-committees for carrying out the recommendations made in the report. The motion was seconded by Dr. MacKellar and carried.

In accordance with the foregoing motion, Dr. Munce appointed the following committee for the purpose of finding a suitable person to serve in the capacity of assistant to the Secretary-Editor:

Dr. C. H. Stange, Chairman
Dr. C. P. Fitch
Dr. Reuben Hilty
Dr. M. Jacob
Dr. W. H. Welch.

For the purpose of investigating and studying the proposal to purchase or otherwise procure a permanent home for the Association, Dr. Munce appointed the following committee:

Dr. R. S. MacKellar, Chairman
Dr. C. A. Cary
Dr. N. S. Mayo
Dr. L. A. Merrllat
Dr. T. A. Sigler.

Acting under the authority of the same motion, the following Special Advisory Committee to the Secretary-Editor was named:

Dr. T. E. Munce, Chairman
Dr. George Hilton
Dr. John R. Mohler

The next question to be considered was the date of the 1928 meeting, to be held in Minneapolis. Drs. Cotton and Fitch reported the results of their investigations to learn what week in August would be preferable from a number of different angles. On account of other large conventions which were scheduled to meet in Minneapolis during the month of August, it appeared that it would be necessary for the A. V. M. A. to meet during either the week of August 6 or August 27. After very careful consideration of these two weeks, a motion prevailed, made by Dr. Hilton and seconded by Dr. Stange, to hold the meeting during the week of August 6.

The next question to be discussed was the duration of the meeting. It was moved by Dr. Goss and seconded by Dr. Hilton that the meeting be held on the following days: Tuesday, August 7, to Friday, August 10, inclusive. The motion was carried.

The selection of a hotel as official headquarters for the convention was next in order and, after hearing from Drs. Cotton and Fitch as to the possibilities in this direction, Dr. Hilton moved that the New Nicollet Hotel be designated our official headquarters for the meeting. The motion was seconded by Dr. Stange and carried.

The Secretary then asked for expressions of opinions relative to the best railroad to be designated as the official route to the convention. After listening to suggestions from Drs. Cotton and Fitch, the Board decided to leave the selection of the official route to the Secretary.

The desirability of publishing a new edition of the A. V. M. A. Membership Directory, sometime during the year 1928, was then discussed. Dr. Hilton moved that a directory be published during 1928 and that the names of the members, instead of being arranged alphabetically, be printed according to geographical

location: by states, provinces, territories, etc. The motion was seconded by Dr. MacKellar and carried.

The Secretary then directed attention to the fact that it would be necessary for the Association to invest the money now in the Salmon Memorial Fund, in order that the income from the Fund be definitely known from year to year. It was pointed out that this money was now on time deposit and it would be desirable to invest the Fund in some other way, so that the interest could be used to take care of the Salmon Memorial Fund Scholarship, the details of which were approved by the Association at the Philadelphia meeting. The Board decided to leave the details to be worked out by Treasurer Jacob and the Secretary. (Since the meeting the sum of $5,500 has been invested in bonds yielding 5½ per cent.)

The Secretary asked for further instructions relative to the four applications that had been held over from the Philadelphia meeting, because the applicants had not been out of college for the full five years prescribed by Section 3 of Article 2 of the By-laws. In view of the fact that the five-year period in these special cases would expire within a few months of the Minneapolis meeting, it was decided to defer final action on these applications until that time.

It was also decided to postpone action on the further amendments to the Constitution and By-laws introduced at the Philadelphia meeting.

The Secretary read a communication from Dr. H. K. Miller, of New York City, relative to the so-called small-animal charity hospitals located in that City and their activities. The whole question was very thoroughly discussed and President Hilty was requested to take the question up with one of the officers of the American Humane Association, with whom he was personally acquainted. The Secretary also reported that Dr. W. G. Hollingworth, of Utica, N. Y., had promised to approach the subject through a similar contact in the person of Mr. Sydney H. Coleman, president of the American Humane Association, who is located in Albany, N. Y.

The Secretary then asked that the Board take specific action on the third recommendation of the special committee. Accordingly, Dr. Stange moved that the Secretary be authorized to secure additional office space in the Book Building. The motion was seconded by Dr. MacKellar and carried.

Dr. Stange then moved that the expenses of Drs. Mayo and MacKellar, incurred in connection with the inspection of the official headquarters of the A. V. M. A., as well as the meeting of the special committee, be paid by the Association. The motion was seconded by Dr. Goss and carried.

A general discussion then followed on the subject of ways and means of increasing the income of the Association and the JOURNAL, for the purpose of helping to defray the increased expenses which the Association was encountering in the very rapid enlargement of the scope of its activities.

The meeting adjourned at 11:55 p. m.

H. PRESTON HOSKINS,
Secretary-Editor.

VETERINARY NOTES FROM CUBA

By N. S. MAYO, *North Chicago, Ill.*

The National Veterinary Association of Cuba has been making efforts to secure a modification of the military regulations that prevent veterinarians in the Cuban Army from being members of the National Veterinary Association of Cuba, but to date no success has attended these efforts.

Dr. Marcial Palacio, a Cuban veterinarian, who was at the head of the Veterinary and Animal Husbandry Department of the National Agricultural Station of Moca, Dominican Republic, was instantly killed in an automobile accident last November.

One hundred and thirty students have entered the Veterinary College of the University of Havana. The reason for this unprecedented number of freshmen apparently lies in the lower entrance requirements for the veterinary course as compared with other departments. It has also been suggested that students entering the veterinary school might later be transferred to the medical school and avoid some of the more rigorous requisites necessary to enter the medical school directly.

It is reported that a number of Cuban veterinarians who practice in the rural districts are considering the formation of a new veterinary association to promote the interests of the rural practitioners in Cuba.

The National Veterinary Association of Cuba has purchased a lot in Colon Cemetery, Havana, and will erect a suitable mausoleum.

ASSOCIATION MEETINGS

PENNSYLVANIA STATE VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Pennsylvania State Veterinary Medical Association was held at the Bellevue-Stratford Hotel, Philadelphia, on September 14, 1927, during the A. V. M. A. convention. No program was presented, but the meeting was given over solely to the transaction of routine business.

Officers for the year were elected as follows: President, Dr. W. Albertson Haines, Bristol; vice-presidents, Dr. Walter G. White, Landsdowne; Dr. Frank J. McNeal, Wilkes-Barre; and Dr. M. P. Hendrick, Meadville; recording secretary, Dr. G. A. Dick, Philadelphia; corresponding secretary, Dr. H. R. Church, Harrisburg; treasurer, Dr. D. R. Kohler, Boyertown; trustees, Dr. F. U. Fernsler, Lebanon; Dr. R. W. Keepers, Greencastle; Dr. E. P. Althouse, Sunbury; Dr. P. K. Jones, Pittsburgh; and Dr. H. B. Cox, Philadelphia.

G. A. Dick, *Recording Secretary.*

ILLINOIS STATE VETERINARY MEDICAL ASSOCIATION

The forty-fifth annual meeting of the Illinois State Veterinary Medical Association was held at the La Salle Hotel, Chicago, November 28-29, 1927. President C. C. Hastings, of Williamsville, called the meeting to order promptly and the minutes of the previous meeting, held at Bloomington, were read and approved.

President Hastings then delivered his address, in which he took occasion to stress the important work and program which had been attempted during the past year. Important legislation looking toward restricting the use of live viruses, and such biologics as are used in the diagnosis and control of infectious and contagious diseases, to legally qualified veterinarians had been attempted but had failed of passage. Success was had, however, in causing the defeat of two bills, which aimed at a revision of our statutes, and which would have again opened up the way for empirics to join our ranks in practice. Dr. Hastings called attention to the fact that our profession had received much more favorable publicity this year than during any similar period of

our existence. He strongly recommended that various articles stressing the necessary intimate relationship between the veterinary profession and agriculture be submitted to the live stock and agricultural press. Such articles are not only acceptable to the press, but are eagerly sought after. A committee should be appointed looking to this end, else a great opportunity is lost. Tuberculosis eradication work was proceeding very rapidly in the State. Small-animal practice, including poultry and sheep, was increasing. On the whole, things looked a little brighter from the practitioner's standpoint.

The report of the the Secretary showed a balance on hand of $153.24. This report was received and ordered placed on file.

The first paper on the program was "Some Phases of Equine Practice," by Dr. C. G. Glendenning, of Clinton, and, like all subjects of an equine character, brought forth an interesting discussion.

Drs. M. W. Ray, state veterinarian of South Dakota; J. I. Gibson, live stock commissioner of St. Joseph; and C. P. Fitch, of St. Paul, were called on and each made a short address of an inspiring character.

Upon reconvening after luncheon, time was allotted to Mr. Finn, secretary of the Chamber of Commerce of Peoria, for the purpose of inviting the Association to meet at Peoria, in July.

Dr. E. H. Agnew, of Waterman, presented the subject of "Vulvo-Vaginitis in Gilts," which brought forth much discussion, the preponderance of opinion being that the condition was of dietetic origin, probably due to moldy corn.

Dr. C. P. Fitch, of St. Paul, spoke on the subject of "Our Present Knowledge of Bovine Infectious Abortion and Its Control." Many were heard to remark that they considered this the best discussion they had ever heard on that subject. Some of the high points were: Abortion is only a symptom; diagnosis can not be made by clinical observation; of great economic importance; in a herd of twenty-four, four aborted in four months, the agglutination test was negative and *Bacillus pyogenes* was found; in another herd of thirty, fourteen reacted after they thought everything was O. K., and next year 60 per cent reacted.

There are just as many different causes of sterility, but if Bang's disease were eliminated, 75 per cent of contagious abortion would be eliminated. *Bacillus pyogenes* is often a serious trouble. Streptococci are many times incriminated, both organisms often being concerned in the bull. The avian tuberculosis

organism also has a predilection for the bovine uterus; not been found in the United States but frequently in Denmark.

The colon organism is also incriminated at times. Dr. Fitch does not think abortion is a deficiency disease unles it is an iodin deficiency, but mineral deficiency is many times the cause of failure to breed. Phosphorus deficiency in the soil is most frequently the cause of sterility, but there is no proof that any of these deficiencies are causes of abortion.

In the bull, the Bang bacillus has been found in the testicle and seminal vesicles, but there is no proof of the bull transmitting abortion.

Dr. Fitch thinks the infection is most likely taken in through the digestive system. The habit of cows licking each other is thought to be the most common cause. Orchitis in the bull is very often a symptom of Bang bacillus infection. Sometimes there is pus in the semen and no orchitis. The organism leaves the uterus 60 days after parturition and locates in the udder. Calves born from infected mothers show infection in the intestinal tract, but it is usually eliminated after sixty days.

The control of Bang bacillus trouble is the important thing. Biologics control tetanus, typhoid, etc., and various products have been recommended for abortion. Experments extending over eight years were conducted at the University of Minnesota. There is no doubt that at times vaccines do confer some immunity, but they are no good over a period of years. England has been the largest user, but without much success and there is no use to expect permanent immunity from such. Bacterins were no good on calves, and through the breeding life of the animal, individual cases do develop immunity, but these are few. One fact that must be remembered is that in an apparently normal parturition the placenta may be infected. At Univeristy Farm a clean herd is maintained, separated by a double fence from an infected herd, with no transfer of the infection.

No test is 100 per cent perfect. An animal may show no reaction to the agglutination test until after an abortion has taken place.

Dr. C. L. Passmore presented a good paper on "Bovine Obstetrics." Dr. L. A. Merillat filled in all spare time during the meeting by conducting a question-box.

Dr. F. A. Laird, state veterinarian of Illinois, spoke on several points of interest to all. All swine shipped into Illinois from other states must be vaccinated by graduate veterinarians. A new

order requires a report to be made concerning all tuberculin used on all cattle or poultry. A report is also necessary on pullorin.

Forty counties in Illinois are now 75 per cent tested for tuberculosis. Seven are fully accredited. Cattle from the 75 per cent-tested counties going into another 75 per cent-tested county must be moved in quarantine, but if going from an accredited county into a 75 per cent-tested county it is unnecessary.

Dr. Floyd Cross, of the Department of Pathology, Colorado Experiment Station, gave a valuable address on "Diseases of Feeding Lambs." Dr. Cross classified these diseases as those incident to shipping, and those due to feeding. Exhaustion, exposure and bad weather render pneumonias common in 40-pound weaklings, with no special germ responsible. Dysentery also is quite common.

Hemorrhagic septicemia is most common and goes in cycles. The animal becomes weak and picks up the germ, usually within the first three weeks after landing. Paratyphoid is not uncommon.

Coccidiosis was first seen in 1924. The main symptom is a bloody diarrhea, with large clots being passed. Many die quickly in 12 to 24 hours. Most of the lesions are found in the cecum, sometimes in the large intestine, with the walls thickened and congested. The mouths are sore, with encrustations on the lips, these being due to necrophorus infection. Lesions have been seen in the abomasum and necrotic areas in the lungs.

Infectious keratitis, with an opacity of the cornea, is not uncommon. Urinary calculi also are very common in lambs, causing what is called "water belly." Quite often the bladder ruptures.

In northern Colorado, alfalfa, corn and beet-pulp products constitute most of the feed, while in the southern part of the State peas are added. The best results seem to be obtained from feeding equal parts of corn and beet pulp, either wet or dry.

Too much corn will kill lambs. They die in a variety of ways. Some jump up in the air, bleat and fall over dead, with no post-mortem lesions whatever. Others develop cerebral lesions and show hemorrhages on the diaphragm or intestines. Others have diarrhea and inflammation of the stomach. Usually it is the large, fat ones that succumb.

Dr. R. C. Julien, former state veterinarian of Indiana, made an address on "Selling the Profession," which was much appreci-

ated. Dr. Reuben Hilty, president of the American Veterinary Medical Association, delivered an interesting address, which was also much appreciated by the membership.

Dr. E. C. McCulloch, of the Department of Animal Pathology, University of Illinois, made a fine contribution to the study of Johne's disease, accompanied by slides of specimens.

One of the finest contributions to small-animal practice, made in recent years, was a paper by Dr. J. M.Cozart, of Evanston, entitled, "Common Skin Diseases Encountered in Small Animal Practice." Its preparation required much work and it contained valuable and interesting data, both from the standpoint of the clinician and statistician.

"Bovine Abortion as Handled in the Field" was a first-class production by Dr. H. S. Wooters, of Champaign. Dr. C. H. Case, of Akron, Ohio, had as his subject, "Dairy Cattle Practice with Special Reference to Herd Examination," and gave many valuable pointers in an address that was much appreciated.

Dr. A. H. Baker asked that the Association invite the A. V. M. A. to meet in Chicago, in 1929, and a motion was made and carried instructing the officers to confer with those of the Chicago Veterinary Association to that end.

Eight new members were added to the roll.

The election of officers resulted as follows: President, Dr. F. A. Laird, Springfield; vice-president, Dr. Harry Caldwell, Wheaton; secretary-treasurer, Dr. W. H. Welch, Lexington. Members of Executive Board: District No. 1, Dr. W. B. Lane, Aurora; No. 2, Dr. Roy E. Kluck, Freeport; No. 3, Dr. H. R. Simkins, Elmwood; No. 4, Dr. J. G. Blum, Normal; No. 5, Dr. A. E. Dickerson, Springfield; No. 6, Dr. L. B. Michael, Collinsville; No. 7, Dr. Robert Rives, East St. Louis.

It was moved and carried that the Executive Board be empowered to fix the time and place for the next meeting. Peoria, Springfield and East St. Louis asked for the next meeting.

W. H. Welch, *Secretary.*

CENTRAL MICHIGAN VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Central Michigan Veterinary Medical Association was held at the Otsego Hotel, Jackson, Mich., December 7, 1927. In the absence of President Main, Dr. L. E. Wileden, of Mason, Mich., occupied the chair.

Dr. B. J. Killham, State Veterinarian, Lansing, Mich., gave a resume of the proceedings of the recent meeting of the United States Live Stock Sanitary Association, held in Chicago, the previous week. Dr. H. J. Stafseth, Michigan State College, East Lansing, Mich., gave a talk on the comparative values of the various tests for bacillary white diarrhea. Dr. H. Preston Hoskins, secretary-editor of the A. V. M. A., Detroit, Mich., addressed the meeting on a number of the activities of the national organization. Dr. E. E. Patterson, Detroit, Mich., gave a short talk on small-animal diseases and hospital management. A general discussion then followed on a number of the points brought out by the speakers.

The meeting closed with a very enjoyable dinner, at which the gentlemen were joined by the ladies, who had been on a shopping trip during the afternoon. After-dinner speeches followed the repast, with Dr. Hoskins filling the role of toastmaster. Dr. Lynn Palmer, of Brooklyn, was elected president for the ensuing year and Dr. W. N. Armstrong, of Concord, was re-elected secretary for his tenth consecutive term.

MAHONING VALLEY VETERINARY CLUB

The regular meeting of the Mahoning Valley (Pennsylvania) Veterinary Club was held at Clearfield, Pa., December 9, 1927. Dr. Wm. J. Lentz, of the University of Pennsylvania, presented "The Diseases of the Alimentary Tract." This was the first lecture and demonstration to be given during the year in connection with the work of the Extension Department of the University.

Officers of the Club, elected at the annual meeting, held at Brookville, Pa., October 11, 1927, are: Dr. M. D. Rentschler, Punxsutawney, Pa., president; and Dr. R. M. Quigley, Tyrone, Pa., secretary.

R. M. QUIGLEY, *Secretary.*

UPPER EAST TENNESSEE VETERINARY MEDICAL SOCIETY

The annual meeting of the Upper East Tennessee Veterinary Medical Society was held in the Medical Building, Knoxville, Tenn., December 10, 1927. Following a very enjoyable dinner at a near-by cafe, the meeting was called to order at 7:00 p. m. by Dr. W. A. Jones, of Johnson City, President. The minutes of the previous meeting were read and approved and a letter

was read from Dr. W. B. Lincoln, State Veterinarian, expressing his regrets at his inability to be present.

Dr. P. W. Allen, head of the Department of Bacteriology, of the University of Tennessee, then delivered an address, entitled, "Some Practical Laboratory Findings." He took up the subject of the disinfection of poultry-yards and brought out the fact that three methods are available for use: first, disinfecting the soil; second, removing the top soil and replacing it with sterile sand; third, changing yards to new locations. Dr. Allen took several samples of soil and experimented with different disinfectants for the purpose of determining which was the most effective. He found that three per cent cresol compound was the most efficient and the cost was determined to be in the neighborhood of $4.60 for disinfecting 400 square feet of soil.

After a rather lengthy and interesting discussion, the Society empowered the Secretary to write letters to the American Veterinary Medical Association and to the Southeastern States Veterinary Medical Association, expressing the feelings of the members of the Society relative to poultry practice. The opinion was strongly expressed that the veterinary profession was very deeply interested in poultry practice and that poultry practice was distinctly a veterinary problem.

Dr. F. W. Morgan, of Chattanooga, then spoke on small-animal practice. He brought out a number of very interesting phases of his practice involving the human element.

It was voted to hold the next meeting in Chattanooga. All officers were re-elected as follows: President, Dr. W. H. Jones, Johnson City; secretary, Dr. R. E. Baker, Morristown.

This organization functions without any dues and for that reason it is not necessary to have a treasurer.

R. E. Baker, *Secretary.*

VETERINARY MEDICAL ASSOCIATION OF NEW YORK CITY

The regular monthly meeting of the Veterinary Medical Association of New York City was held at the Academy of Medicine, 103rd St. & 5th Ave., New York City, December 7, 1927. Dr. C. G. Rohrer presided. The minutes of the November meeting were read and approved.

Dr. Hadley C. Stephenson, of the New York State Veterinary College, gave a paper on different case reports, including intus-

susception, fistula due to diseased tooth, ulceration of the eye, keratitis, and cyst in the throat under mandible. Dr. Stephenson gave a very thorough report on the above-mentioned cases. They were discussed by Drs. Gannett, Chase, Amling, Crawford, MacKellar and Zepp.

A rising vote of thanks was extended Dr. Stephenson by the Association for his contribution to the program.

Dr. MacKellar reported and showed a specimen of calculus, about the size of a hen's egg, which he removed from the penis of a gelding. It was a very interesting case.

There being no further literary program, new business was taken up. Drs. John Beacon, of New York City, and J. S. Crawford, of Far Rockaway, L. I., were elected to membership.

Dr. Henry Amling suggested that the Association arrange for some program of broadcasting over the radio. This was discussed, after which Dr. Gannett moved that the subject of broadcasting be laid on the table and await the action of the New York State Veterinary Medical Society. Seconded by Dr. J. Elliott Crawford and carried.

The Treasurer's report was read and the books were audited by Drs. J. Elliott Crawford and R. J. Garbutt.

The election of officers for the ensuing year resulted as follows: President, Dr. C. G. Rohrer; vice-president, Dr. O. E. McKim; secretary-treasurer, Dr. C. P. Zepp. Censors: Drs. R. W. Gannett, L. A. Corwin, R. J. Garbutt, L. W. Goodman and J. Elliott Crawford. Member to the Policy and Publicity Committee of the New York State Veterinary Medical Society: Dr. C. S. Chase.

The Association was honored by the presence of Dr. K. F. Karolyi, of New York City, formerly dean of the Veterinary College of Constantinople, Turkey. He gave a short talk, comparing our veterinary work with that of his country.

There being no further business, the meeting was adjourned.

C. P. ZEPP, *Secretary.*

NEBRASKA STATE VETERINARY MEDICAL ASSOCIATION

The thirtieth annual meeting of the Nebraska State Veterinary Medical Association was held in Lincoln, December 13-14, 1927.

This meting was by far the best and most successful in the history of the Association. In the first place, we were honored

by the presence of Dr. Reuben Hilty, president of the American Veterinary Medical Association. The program had especial merit, and such men as Dean Dykstra, Kansas State Agricultural College; Dr. C. H. Covault, Iowa State College; Dr. L. Van Es, director of the State Pathological Laboratories; Dr. Chas. H. Bower, Topeka, secretary-treasurer of the Kansas State Veterinary Medical Association; Dr. Frank Breed, a bacteriologist of national reputation; Dr. Elmer Lash, of the U. S. Bureau of Animal Industry, and Dr. A. T. Kinsley, of Kansas City, Missouri, the nationally known authority on swine, had places on this program.

The annual banquet was held at the Eastridge Country Club, and well over two hundred veterinarians and their wives attended this banquet. Dr. Hilty gave the evening address, which was very much appreciated by those present. It was one of those sound, logical and helpful addresses that does one a great deal of good. We want to thank Dr. Hilty publicly for being with us.

It was voted to hold our next annual meeting at Omaha, December 11-12, 1928.

GEO. A. YOUNG, *Secretary.*

WABASH VALLEY VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Wabash Valley Veterinary Medical Association was held at Kokomo, Ind., December 15, 1927. A business session was held in the Council Chambers of the City Building during the afternoon and a banquet was held at the Frances Hotel in the evening.

Dr. Edward A. Cahill, of Pitman-Moore Company, Indianapolis, delivered the main adrdess of the meeting. He discussed abortion disease in cattle and its control. Dr. Cahill pointed out the enormous economic loss caused cattle-raisers by this disease and stated that carefully conducted experiments have shown that cows suffering from the disease produce an annual loss of $40 per head to their owners. Dr. Cahill stated very strongly that the control of abortion disease, like all other live stock diseases, should be vested in the hands of the practicing veterinarian and that his services and advice should be obtained when the first evidence of the disease becomes manifest.

Wives of the visiting veterinarians were entertained during the afternoon at the home of Dr. and Mrs. G. M. Wagaman. In the evening they joined their husbands at the banquet.

Officers were elected as follows: President, Dr. J. H. Mills, Russiaville; vice-president, Dr. J. F. Roberts, Swayzee; secretary, Dr. C. J. Hufty, Burlington.

The next meeting of the Association will be held in Marion, on February 9.

NORTHEASTERN INDIANA VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Northeastern Indiana Veterinary Medical Association was held in Fort Wayne, December 20, 1927.

Dr. S. D. Wiles, of Fort Wayne, addressed the Association on "The Progress of the Profession in Recent Years." Dr. Paul C. Kucher, of the Fort Wayne Board of Health, made an interesting report on milk sanitation, mentioning some of the diseases of infants caused by impure milk. Dr. R. C. Julien, of Indianapolis, delivered a short address on several veterinary problems.

A banquet was served at six o'clock and a theater party was given for the ladies in the evening.

Officers for the year were elected as follows: President, Dr. H. W. Demsey, Huntington; vice-president, Dr. C. E. Haflich, Markle; secretary-treasurer, Dr. Harvey Hostetter, Albion.

SOUTHEASTERN MICHIGAN VETERINARY MEDICAL ASSOCIATION

The regular monthly meeting of the Southeastern Michigan Veterinary Medical Association was held at the Detroit Board of Health headquarters, December 14, 1927. The attendance was thirty-nine and the meeting turned out to be the second largest in the history of the organization.

The evening program was devoted to a discussion of the new ordinance which went into effect in Detroit, January 1, 1928, requiring that all milk sold in Detroit shall come from cows in herds under federal or state supervision. The discussion was opened with a few remarks by Mr. Edward Schultz, head of the Food Inspection Division of the Detroit Board of Health. He introduced Mr. Edwin J. Smith, Chief Milk Inspector, who then told of the steps leading up to the passage of the ordinance by the Detroit City Council, in February, 1927.

Dr. B. J. Killham, State Veterinarian, then spoke at considerable length on the part to be played by the Michigan Department

of Agriculture. Dr. Killham stated that it had been brought to his attention that certain practitioners were objecting to the wording of the ordinance. These objections appeared to be founded on two assumptions: (1) That, in specifying that the milk should come only from herds tested under federal and state supervision, it was inferred that the practicing, accredited veterinarian was not capable of conducting tests in a proper manner. (2) That the provisions of the ordinance would result in a loss of business for the veterinarians in the Detroit milk area.

The first assumption was answered by indicating that the question involved was not one relating to the ability to test, but rather a problem of supervision. Confidence in the ability of the accredited veterinarian has been demonstrated through employing several such men as official veterinarians and paying for their services from state funds.

It was demonstrated that the second assumption was unfounded because an analysis of the testing conducted by local, accredited veterinarians in certain counties included in the Detroit milk area, in which the official tuberculin testing has been started early in the year, showed that there was practically no difference in the amount of testing conducted by local veterinarians prior to the inauguration of the official work and since such testing had been started in these particular counties.

A review of the testing by local veterinarians during the past six years showed that the testing under federal and state supervision has not decreased the amount of testing performed by the local veterinarians, but rather had undoubtedly been the cause of a large increase in this particular kind of work for the practitioner.

Dr. T. S. Rich, B. A. I. Inspector-in-Charge, Lansing, then briefly outlined the part that the federal forces would play in carrying the ordinance into effect. Dr. Rich reviewed the history of tuberculin testing in the United States for over thirty years. He then briefly summarized what had been accomplished in Michigan. He gave the results of his investigations of the various local ordinances on the books in cities and towns throughout Michigan. Many of these were of very little value, so far as protecting the public from the consumption of impure milk was concerned.

Among other things, Dr. Rich stated that there were thirty-three cities in Michigan with a population of 10,000 or more and that there were about one hundred cities and towns with popu-

lations between 1,500 and 10,000. During the investigation ninety-seven cities were visited and it was found that forty-eight had some sort of a milk ordinance and forty-nine of these were without ordinances. Of the forty-eight cities with ordinances, in twenty-eight cases it was found that no attempt was being made to enforce the ordinance on the books. Of the total of the ninety-seven cities visited, it was found that seventy-two were being protected by reason of the fact that all herds supplying milk to these cities were under state and federal supervision.

It was further stated by Dr. Rich that he had found it very difficult to get reliable information concerning the tuberculin testing of herds in connection with local ordinances. In practically every instance, either the local health officer or the city clerk advanced the information that an ordinance existed and these officials believed that the ordinance was being lived up to. Upon further questioning, however, it was revealed that in many cases these officials did not really know what a tuberculin test was. Dr. Rich stated that the ignorance shown concerning the tuberculin testing of cattle was almost beyond belief. He stated that in many instances the local officials did not know the difference between a butter-fat test and a tuberculin test. They believed that the tuberculin test meant either the examination of the milk or a Babcock test.

Dr. E. B. Cavell, of Northville, then gave his views as to the proper place of the local practitioner in tuberculin testing. Dr. Cavell stated that he would like to feel that his clients could employ him to test their herds whenever necessary, either in connection with any requirements of the Detroit Board of Health or incident to any systematic testing conducted under proper official supervision. A general discussion followed and many questions were asked and answered relative to the new ordinance.

Dr. Warren P. S. Hall then showed three motion pictures secured from the U. S. Department of Agriculture: "Liars or Layers," "Great Dairy Sires and Their Daughters" and "Poultry Pests."

The meeting adjourned at 10:30 p. m.

Banquet in Honor of Dr. Schaffter

On December 21, 1927, the Association honored Dr. E. P. Schaffter with a farewell dinner, prior to his leaving for Los Angeles, Calif., to take charge of the meat inspection station of the Bureau of Animal Industry at that point. Dr. Schaffter had

been in charge of similar work in Detroit since September 1, 1912. During the fifteen years that he had been stationed in Detroit, he had built up a very wide acquaintance among local veterinarians. The dinner was attended by thirty members of the profession from Detroit and vicinity and was a complete surprise for Dr. Schaffter.

Dr. H. Preston Hoskins acted as toastmaster and called upon the following for short addresses: Dr.H. T. Carpenter, of Detroit, one of Dr. Schaffter's classmates at the Ontario Veterinary College; Dr. Reuben Hilty, of Toledo, Ohio, president of the American Veterinary Medical Association; Dr. H. H. Sparhawk, of Detroit, formerly a member of Dr. Schaffter's staff; Dr. E. E. Patterson, of Detroit, president of the Southeastern Michigan Veterinary Medical Association; Mr. Martin Stapleton, of the Michigan Department of Agriculture; Dr. T. S. Rich, B. A. I. Inspector-in-Charge, Lansing; Dr. B. J. Killham, of Lansing, State Veterinarian; Dr. Ward Giltner, of Michigan State College; Dr. Z. Veldhuis, a member of the B. A. I. force at Detroit; Dr. Joseph Hawkins, who was the first B. A. I. veterinary inspector in Detroit; and Dr. C. W. Eddy, of Detroit. The latter, on behalf of about forty friends of Dr. Schaffter, a number of whom were unable to be present, presented him with a handsome traveling bag as a token of the high esteem in which Dr. Schaffter was held by his associates. Dr. Schaffter was so completely surprised by the events of the evening that he found it difficult to say very much, but spoke very feelingly of his many contacts with the local veterinarians. It was a memorable occasion for everyone present.

H. Preston Hoskins, *Secretary.*

UNIVERSITY OF PENNSYLVANIA CONFERENCE FOR VETERINARIANS

The conference opened promptly at 2 p. m., with a large attendance, on January 4, 1928. Dr. H. E. Bemis was the first on the program. He discussed the subject of "Local and Regional Anesthesia" and demonstrated the methods of making injections. His demonstrations of making intradermal injections of a local anesthetic and nerve-blocking were particularly interesting. He was followed by Dr. W. J. Lee, who demonstrated nerve-blocking in the legs of horses and simple effective restraint for making the injections. The cow, horse and pig were used in these demonstrations.

Dr. Malcolm J. Harkins next presented an interesting and instructive paper on "The Newer Knowledge of the Etiology of Canine Distemper." The discussion following this paper indicated that this subject is of the greatest interest to veterinarians.

Dr. R. S. Amadon presented a review of the research work he has done on milk fever during the last year. His conclusions are that his investigations indicate that milk fever is not due to a hypoglycemia.

The evening session was opened by a discussion of avian tuberculosis, which was presented in a thorough manner by Dr. E. L. Stubbs. This disease is growing in importance and for this reason its discussion at this time was very appropriate. The spread of avian tuberculosis among swine is one of the economic phases of the disease that Dr. Stubbs emphasized.*

Dr. M. F. Barnes, of the Pennsylvania Bureau of Animal Industry, discussed the subject of "Bang Bacillus Disease; Its Control and Prevention," in a very able manner. This subject, because of its importance and its many angles, is one that veterinarians never tire of discussing.

Dr. W. J. Lee next reported the use of gelatin in the treatment of six cases of purpura hemorrhagica. The use of this substance has been reported by foreign veterinarians. The results have been varied and more work must be done before any definite recommendations can be made.

One of the most interesting numbers on the program was the demonstration by Dr. B. M. Underhill, of the examination of fecal material for eggs of parasites. He showed, by the use of a few simple pieces of glassware and a microscope, how such examinations can be made by any practitioner. The technic is simple and should be known and used by every practicing veterinarian. This demonstration concluded the program of the first day.

The morning session of the second day was called to order promptly at 9 o'clock. Dr. W. J. Lentz demonstrated several operations and discussed some cases in small animals that came in the morning clinic. As usual, this was an interesting part of the program. Dr. Lentz presented some facts that practitioners can use in their everyday work.

Professor John W. Harshberger, of the Department of Botany, University of Pennsylvania, discussed the subject of "Poisonous Plants." He prefaced his discussion with some timely remarks

*Published in this issue.

showing the need of research on this subject and indicated how it should be done. Dr. Harshberger has been teaching the subject of poisonous plants in the Veterinary School for nearly forty years and is especially well qualified to present this subject in an interesting manner.

Dr. W. G. Hollingworth, city veterinarian of Utica, N. Y., told the conference how he established dairy and meat inspection in his home city. Dr. Hollingworth is a live wire. Every veterinarian in the United States should hear his story and then follow his example. Public health work is destined to be one of the most important fields of work for our profession and the sooner we recognize this fact the better.

The afternoon session was opened by a lively discussion of "Some Tendencies of Modern Finance," by Prof. Theodore J. Grayson, director of evening and extension schools, University of Pennsylvania. The subject of finance is something that most professional men know very little about. We will try to make further use of the unusual ability of Prof. Grayson to present this subject in an interesting manner.

In reviewing the papers presented at this conference, each one as we think of them seems to be the best, they were all so unusually interesting and well presented. The next number on the program was certainly of unusual interest. It was presented by Dr. H. W. Schoening, of the U. S. Bureau of Animal Industry, and illustrated with lantern-slides. The subject, "Experimental and Field Results of the Single-Injection Canine Rabies Vaccine," is one in which every veterinarian is interested.

The final number on the program was a paper by Dr. S. E. Bruner, of the Pennsylvania Bureau of Animal Industry, on the subject of "The Private Practitioner's Part in Handling Tuberculosis." Dr. Bruner's paper was well taken and concluded one of the most interesting and well attended conferences held at this school.

All papers were thoroughly discussed, making it a conference of veterinarians in every sense of the word.

G. A. Dick.

CALIFORNIA VETERINARY CONFERENCE

The annual veterinary conference given jointly by the California State Veterinary Medical Association and the Division of Veterinary Science, University of California, was held at University Farm, Davis, January 3-6, 1928.

As is the usual custom, two prominent veterinarians were secured from other states to deliver a series of lectures during the conference.

Dr. E. L. Quitman, of Chicago, delivered a series of six lectures on subjects relating to small-animal practice. His first lecture was entitled "General Principles of Small-Animal Practice." His second lecture dealt with the handling, restraint and administration of medicine in small-animal practice. The subject of his third lecture was "Surgical Conditions in Small-Animal Practice." In his fourth lecture he spoke on "Drugs of Special Application in Small-Animal Practice." His fifth and sixth lectures covered other features of small-animal practice in general.

Dr. V. A. Moore, of Ithaca, N. Y., gave five lectures, chiefly on infectious diseases of cattle, as follows:

The Role of the Veterinarian in the Prevention and Control of Infectious Diseases.
Rabies and Its Control.
Some Factors in the Permanent Control of Bovine Tuberculosis.
Johne's Disease.
Human Infection with *Brucella Abortus*.

Two interesting lectures, one on "Tuberculous Lymphadenitis," and one entitled, "Normal Anatomy and Repair of Dental Tissue with Special Reference to the Dog," were delivered by California physicians.

The remainder of the program was given by members of the faculty of the College of Agriculture and veterinarians of California.

Dr. K. F. Meyer gave a very interesting and instructive illustrated lecture on the mountains and mountain-climbing in Switzerland. Judging from the lecture and slides presented, Dr. Meyer is as skilled a mountain-climber as he is a bacteriologist.

The register showed 150 names. Fifty-one veterinarians were admitted to membership in the Association and one veterinarian was reinstated.

One evening was given over to an adjourned meeting of the California State Veterinary Medical Association, as is customary. During this meeting, routine business was conducted and several committees reported. The committee appointed to try and secure an increase in salary for the veterinarians employed by the State Department of Agriculture gave a very favorable report, following their conference with Director G. H. Hecke.

W. L. CURTIS, *Secretary*.

NECROLOGY

HARRISON WHITNEY

Dr. Harrison Whitney, of New Haven, Conn., died in Bangor, Me., December 8, 1927, at the age of sixty-nine.

Born in Harrison, Me., Dr. Whitney attended Bates College and received his degree of B. A. in 1884. He then attended Harvard University and received his degree of M. D. V. in 1887. Immediately after his graduation, he located in New Haven, Conn., and continued in private practice there until his health failed him about two years ago.

Dr. Whitney joined the A. V. M. A. in 1888 and at the time of his death was one of the oldest members on the roll. He was also a member of the Connecticut Veterinary Medical Association. Dr. Whitney was a highly respected, honorable and capable veterinarian and he will be greatly missed by his friends, patrons and associates. He is survived by his widow and two daughters.

G. E. C.

JAMES T. CULLEN

Dr. James T. Cullen, of Fargo, N. D., died in St. John's Hospital, Fargo, December 31, 1927, following an operation for obstructive jaundice.

Born at Watkins, N. Y., February 12, 1884, Dr. Cullen attended the grade and high schools of his native town and then entered the Ohio State University. He received the degree of Doctor of Veterinary Medicine in 1910 and located at Elmyra, N. Y., where he engaged in private practice for one year. In 1911, Dr. Cullen entered the service of the Bureau of Animal Industry and was stationed at Chicago. The following year, he was transferred to South St. Paul, where he remained until 1925. At that time, he was transferred to Fargo, N. D., as inspector-in-charge at the Armour Packing Company plant, which position he held at the time of his death.

Dr. Cullen joined the A. V. M. A. in 1925. He was a member of the National Association of B. A. I. Veterinarians, the Knights of Columbus and the Alpha Psi Fraternity. He is survived by his widow, three sisters and three brothers.

Dr. Cullen was an unusually conscientious man, a very efficient veterinary inspector and a dependable and reliable public servant.

A. F. S.

WILLIAM T. S. WERNTZ

Dr. William T. S. Werntz, of Brookline, Pa., died January 4, 1928. He was a graduate of the University of Pennsylvania, class of 1893. A few days before his death he received an appointment in the Pennsylvania Department of Agriculture. Dr. Werntz was active in Delaware County politics for many years. He is survived by his widow and one daughter.

TOOIE A. GEDDES

Another veterinarian who was with the Bureau of Animal Industry for many years, has passed away. Dr. Tooie A. Geddes, a member of the staff of the Packers and Stockyards Division of the U. S. Bureau of Animal Industry, died at Walter Reed Hospital, Washington, D. C., on the evening of January 21, 1928. He had been in ill health for several months from heart, kidney and lung complications.

Doctor Geddes was born in Vinton, Iowa, October 26, 1869, where he attended the public schools and Tilford's Academy before entering the Veterinary Department of Iowa State College of Agriculture, where he was graduated in February, 1889. After practicing his profession in Iowa for about four years, he entered the Bureau of Animal Industry in 1893 and was assigned to the Chicago station. His energetic, efficient service attracted attention and within two years he was placed in charge of a field station.

At the beginning of the year 1899, he became chief of the Miscellaneous Division of the Bureau of Animal Industry, and in 1900 was sent to England to assist Dr. W. H. Wray in his work in connection with our import and export animals. He remained abroad until 1909,when he was transferred to the Chicago station.

In 1910 he resigned from the Bureau to become an agent for live stock breeders who desired his services in selecting valuable animals which they desired to purchase in England and the Channel Islands.

In 1921 he returned to the public service and became a member of the Packers and Stockyards Administration, and in 1924 he was made district supervisor, with headquarters at Atlanta, Georgia. In 1925 he was transferred to the Washington headquarters, where he remained until the time of his death.

Dr. Geddes was a World War veteran. On enlisting in May, 1917, he was assigned to the Quartermaster's Corps, Remount Service, and attained the rank of Major before his honorable discharge in March, 1919. He was buried with military honors in Arlington Cemetery. He is survived by his widow.

Dr. Geddes was a man of fine personality and genial disposition and his many friends in this country and the British Isles will be grieved to learn of his death.

U. G. H.

ERNEST C. SCHROEDER

A brilliant career in the field of veterinary medicine and pathology was ended with the death of Dr. Ernest C. Schroeder, January 24, 1928, at Bethesda, Md., where he was Superintendent of the Experiment Station of the Bureau of Animal Industry. During his forty years of public service, Dr. Schroeder

DR. E. C. SCHROEDER

gained an international reputation as a research worker and made important contributions to the knowledge of animal diseases.

He was born in Baltimore, Md., April 3, 1865, and after an elementary education studied scientific agriculture at the Maryland Agricultural College. Later he received the degree of M. D.

V. from Harvard University in 1887. In the same year Dr. Schroeder accepted an appointment in the Bureau of Animal Industry, then a new organization, engaged, among other activities, in the suppression of contagious pleuropneumonia of cattle. In 1890 he was transferred to the laboratory of pathology and bacteriology, and in 1894 became Superintendent of the Bureau Experiment Station at Bethesda, Md., a position which he filled until his death.

Under Dr. Schroeder's administration the station developed from a small beginning in leased quarters, to a well-equipped research institution widely recognized for important contr butions in the study of animal disease problems.

Besides being an unusually thorough and resourceful investigator whose results commanded wide attention, Dr. Schroeder was likewise a clear and forceful writer and speaker. Animal diseases which have received particular study at the Experiment Station were tuberculosis, contagious abortion, anthrax, dourine, tetanus, tick fever, and vesicular stomatitis. The last-named malady is important because of its similarity to foot-and-mouth disease, a highly infectious foreign plague. Dr. Schroeder was also a skilled investigator of the purity and potency of biological products used in veterinary medicine.

Dr. Schroeder joined the A. V. M. A. in 1888 and filled many important committee assignments during his membership. He was a member of the Committee on Diseases, 1909-10; a member of the Committee on Legislation, 1910-11; member (1909-20) and chairman (1920-21) of the International Commission on Bovine Tuberculosis; and a member of the Committee on Abortion, 1919-25. In 1926 he was appointed A. V. M. A. representative to the American Association for the Advancement of Science, a post which he held at the time of his death.

A series of complications impaired his health and death followed an illness of several months. Dr. Schroeder is survived by a son, a brother, and a sister, his wife having died in November, 1927.

U. G. H.

Our sincere sympathy is extended to Dr. C. C. Nickel, of Nowata, Okla., in the death of his wife, December 26, 1927, after an illness and hospital confinement of six weeks. Mrs. Nickel left four children to mourn her loss.

PERSONALS

MARRIAGES

Dr. James F. Savage (K. S. A. C. '25), of Trenton, N. J., to Miss Valeta M. Hill, October 19, 1927, at Dodge City, Kans.

Dr. O. E. Walgren (K. S. A. C. '26), of Platte Center, Nebr., to Miss Lucille Scheidel, December 22, 1927, at Platte Center.

Dr. Herman Farley (K. S. A. C. '26), to Miss Gainor Kossler, both of Blacksburg, Va., December 26, 1927, at Blacksburg.

Dr. Frank Hare (K. S. A. C. '20), of Dover, Del., to Miss Margaret Haggen Cole, December 26, 1927, at Lexington, Ky.

Dr. Philip Ray Carter (K. S. A. C. '26), of Minneapolis, Minn., to Miss Garnett Elizabeth Kastner, of Manhattan, Kans., December 27, 1927, at Manhattan.

Dr. Claude A. Henley (O. S. U. '25), of Jacksonville, Ill., to Miss Jean Eleanor Dinwiddie, December 27, 1927, at Pekin, Ill.

Dr. Claude H. Reading (Mich. '27), of Hopkins, Mich., to Miss Irene Vought, of Decatur, Mich., December 28, 1927, at Decatur.

Dr. D. R. Herberich (Chi. '20), of Kempton, Ill., to Mrs. Margaret Wierschem, of Chicago, Ill., January 14, 1928, at Chicago.

PERSONALS

Dr. C. V. Gott (T. H. '14) is mayor of Portland, Ind.

Dr. W. G. Irvin (Cin. '15) has removed from Flemingsburg, Ky., to Owingsville, Ky.

Dr. O. B. Neeley (Iowa '24) has removed from Chattanooga, Tenn., to Franklin, Tenn.

Dr. M. C. Hawn (Iowa '27), formerly of Webster City, Iowa, is now located at Johnson, Nebr.

Dr. Raymond H. Arpke (Iowa '27), formerly of Sheboygan, Wis., is now at Sheboygan Falls, Wis.

Dr. L. N. Peterson (Chi. '10), has requested a change of address from Raton, N. Mex., to Center, Colo.

Dr. W. S. Plaskett (McGill '93) has returned to his home in Clinton, Mass., after an extended absence.

Dr. J. N. Horn (Chi. '15), of Peoria, Ill., has announced his candidacy for alderman to represent his ward.

Dr. Frederick G. Harbaugh (Iowa '27), of Lubbock, Texas, spent Christmas with his parents at Wilmette, Ill.

Dr. W. T. Hinshaw (T. H. '14), formerly of Winchester, Ind., has removed to Sabina, Ohio, for general practice.

Dr. F. G. Roth (Ind. '17), of Crown Point, Ind., has been reappointed Lake County (Ind.) Veterinarian for another year.

Dr. H. D. Larzelere (O. S. U. '09), formerly located in Eau Claire, Wis., gives a new address: 824 Benton Ave., Janesville, Wis.

Dr. E. F. Sheffield (O. S. U. '22), who has been practicing in Detroit, Mich., for several years, has returned to his home in Richland, Mich.

Dr. J. B. McQuown (O. S. U. '19) has opened an office for the practice of veterinary medicine and surgery at 512 Pleasant Ave., Prescott, Ariz.

Dr. W. J. Ridgway (Ind. '99), of Robinson, Ill., lost a large barn, by fire, at his farm one mile east of Robinson, about the middle of December.

Dr. E. N. Brown (Chi. '06), of Nashville, Tenn., has been appointed City Dairy Inspector, under an ordinance recently enacted by the City Council of Nashville.

Dr. O. P. Jones (Corn. '15) has accepted a temporary appointment in the Department of Surgery in the New York State Veterinary College, Cornell University.

Dr. M. H. Mabey (Corn. '17), of Cuba, N. Y., has given up his practice at that place and has accepted a position with Borden's Farm Products Company of New York.

Dr. J. R. Roche (Iowa '23) has resigned his position with the Sioux City Serum Company, Sioux City, Iowa, and has returned to private practice at Gowrie, Iowa.

Dr. C. R. Strange (Colo. '23), of Johnstown, Colo., is now a member of the staff of the Department of Veterinary Science, University of Wisconsin, Madison, Wis.

Dr. D. E. Sisk (K. C. V. C. '15), of Mansfield, Ill., is spending the winter in Oklahoma. He has asked to have his JOURNAL forwarded to him each month at Perry, Okla.

Dr. C. E. Mummert (Ind. '07), formerly of Young America, Indiana, has removed to Logansport, Ind. Dr. Mummert devotes considerable of his time to poultry diseases.

Dr. J. F. Bullard (Corn. '22) has resigned his position at the Kentucky Agricultural Experiment Station and has taken the position formerly held by Dr. M. G. Fincher.

Dr. Frederick R. Whipple (McK. '02), of Peoria, Ill., is building a new small-animal hospital in Chicago, where he expects to practice after the completion of the hospital.

Dr. H. C. H. Kernkamp (O. S. U. '14), of the University of Minnesota, is enjoying a sabbatical leave at the Iowa State College, where he is pursuing investigational work with swine diseases.

Dr. Charles A. Mahl (Chi. '18) has given up his private practice at Vienna, Ill., to accept a position with the Illinois Department of Agriculture. He has been assigned to tuberculosis eradication work.

Dr. H. B. McMurray (Corn. '24) has resigned his position in the Department of Surgery in the New York State Veterinary College, Cornell University, and has entered private practice at Cuba, N. Y.

Dr. Harold L. Watson (Gr. Rap. '15), of Montpelier, Vt., was one of the victims of the serious flood which visited New England during the latter part of 1927. He reports his loss as being over $2000.

Dr. C. H. Wright (Ont. '08), of Jackson, Tenn., was able to return to work about December 1, following an operation for abscess of the appendix, performed at the Mayo Clinic, Rochester, Minn., in August.

Dr. M. G. Fincher (Corn. '20) has resumed his work in the Department of Medicine, New York State Veterinary College at Cornell University, after an absence of a year spent in Kentucky studying diseases of horses.

Dr. Alfred Savage (Corn. '14), of the Manitoba Agricultural College, Winnipeg, is enjoying leave of absence for a year. He is at the Royal (Dick) Veterinary College, Edinburgh, Scotland, and he expects to remain abroad until August.

Dr. C. F. Barnes (Gr. Rap. '15), of St. Louis, Mich., was knocked down and badly injured by an angry bull while doing the evening chores on his farm, just before Christmas. Dr. Barnes received several fractured ribs, with possible internal injuries.

Dr. T. E. LeClaire (Laval '90), of Calgary, Alta., has been spending the winter months at his winter home near Pasadena, Calif. Dr. LeClaire will leave California in May or June, expecting to go East as far as Montreal, before returning to western Canada.

Dr. T. P. Gallahue (Chi. '17), of Monmouth, Ill., has been appointed Lake County (Ill.) Veterinarian, succeeding Dr. D. C. Grinnell (McK. '11), who failed to secure the approval of the State Department of Agriculture. The appointment of Dr. Gallahue was for one year, effective February 1, 1928.

Dr. C. W. McLaughlin (Chi. '17), has resigned his position with the Western Weighing and Inspection Bureau and has accepted a position with Pitman-Moore Company of Indianapolis. Dr. McLaughlin has been making his home in Melvin, Ill., but he expects to establish his headquarters at Bloomington, Ill.

Dr. R. H. Hamner (A. P. I. '19), of the Tuberculosis Eradication Division, U. S. Bureau of Animal Industry, stationed at Birmingham, Ala., attended the annual meeting of the National Association of B. A. I. Veterinarians, held in Chicago, in December. Dr. Hamner reported a very successful conference and a pleasant trip.

Dr. J. S. Donald (Ont. '86), of Bay City, Mich., was painfully cut about the face and head, the latter part of December, when his car left the pavement on one of the roads near Bay City and landed in a ditch. It is believed that Dr. Donald fainted and lost control of the car, as he does not remember any details of the accident.

Dr. H. M. Rinehart (Chi. '05), of Knoxville, Ill., met with a painful accident when his horse bolted and threw him to the pavement about one mile from Knoxville, December 19, 1927. Two children on their way to school found Dr. Rinehart, lying face down on the road, unconscious. His horse was found standing near the spot where the accident happened.

Dr. E. M. Massinger (N. Y. C. V. S. '91), of Phoenixville, Pa., is spending a vacation of three months in California, accompanied by Mrs. Massinger. Dr. Massinger requested that his JOURNAL be sent to him at Chula Vista, during his stay in California, and he incidentally mentioned the fact that this is the first vacation, outside of fourteen days, that he has taken during a period of thirty-six years. He left his practice in care of his son, Dr. Charles Massinger (U. P. '27), during his absence.